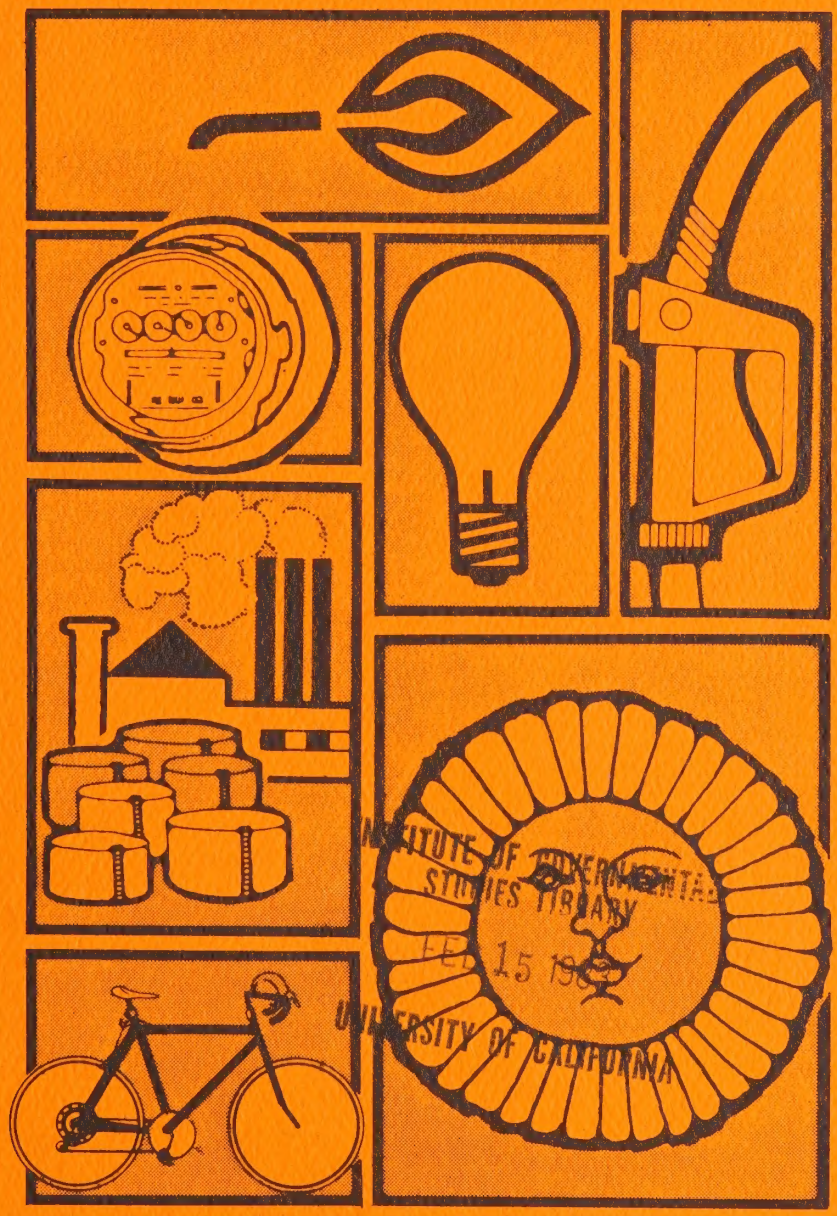
ENERGY SUB-ELEMENT OF THE GENERAL PLAN



ENERGY SUB-ELEMENT OF THE GENERAL PLAN

This sub-element complies with California Government Code Section 65303(k)

November, 1981

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DEFINITION OF TERMS

BTU	A British thermal unit equal to the amount of heat required to raise one pound of water one degree farenheit.
BTU/D	BTU per day
MBTU	Million BTU
Therms	Unit used by utilities to measure actual gas heat value sold to customers. The average household uses 50 therms per month. One therm is 100,000 BTUs.
Kilowatt hour (KWH)	A unit of electrical energy equivalent to 3,413 BTU of heat energy expended per hour. A kilowatt hour is equal to ten 100w light bulbs burning for one hour.
Retrofit	To upgrade existing facilities and equipment to energy efficient standards.
Load Management	A technique used to control the peak demand for electricity. Peak demand is a factor used by utilities in billing. The higher the demand, the higher the rate charged.
Waste-stream	The quantity of components of municipal garbage.
Recycling	The process of removing products generally considered as waste from the waste-stream and getting these products into a form that allows reuse.

EXECUTIVE SUMMARY

INTRODUCTION

The main development years in Sunnyvale were at the time when energy resources were thought to be plentiful. For the most part, energy conservation was ignored in decisions related to land use, transportation, environmental management, and governmental operations. The City of Sunnyvale is not unlike most other communities in this regard.

The world energy crisis is severely affecting the lives of our residents. About 1/3 of the world energy resources are used by the United States whose population is about 1/20th of the world population. The severity of the world's energy situation makes it imperative that this trend changes. Effective energy management policies can significantly reverse this trend.

Energy management is being addressed at all levels of government. The approaches used at the various levels of government vary from an emphasis on increasing the production of non-renewable and renewable fuels by the Federal Government to a focus on conservation and solar energy use by the State of California. Local governments are in a position to create a substantial impact in energy conservation and management due to their control in the areas of land use, transportation, building design and environmental management.

PURPOSE

The Energy Sub-element is the City of Sunnyvale's short and long term strategy for dealing, at the local level, with the impacts of diminishing energy resources. Energy impacts various areas of municipal government; therefore, this sub-element contains the energy provisions which are included or will appear in the other elements and sub-elements of the General Plan. As the other sub-elements are developed, the goals, policies and action statements contained here will be integrated.

MAJOR FINDINGS

The major findings of this sub-element are summarized here. More specific information is included within the sub-element.

Energy Economics

Energy as a commodity follows the classical rules of supply and demand. As the supply of energy resources decreases and the demand rises or remains constant, the price of energy increases. It is predicted that by 1985 residents will spend approximately 10% of their net income on energy. In 1980 dollars, the cost of electric energy will increase by about 50%, by the year 2000. The cost of natural gas will increase by over 220% and the cost of gasoline will increase by about 96%. The increases do not include an annual rate of inflation.

Transportation

The predominant means of transportation is the single-occupant automobile. Weekday travel on Sunnyvale roadways is 1.86 million miles, consuming approximately 115,000 gallons of fuel. Using the projected price of gasoline, this will amount to $45,000,000 annually in 1980 dollars by the year 1985.

Eight-thousand, two-hundred daily bus trips are made to and from Sunnyvale. Half of these trips are by residents. Proposed new bus routes in Sunnyvale will decrease the percent of residents not served by bus from a current 61% to 30% by 1981. Efforts are being made to increase alternative modes of transportation. At Lockheed 1930 employees ride-share or use company sponsored buses. Additionally, 205 residents are registered with Bay Area RIDES and 879 persons registered at Bay Area RIDES have Sunnyvale destinations.

Energy Uses in the City

Consumption of electricity by the residential, commercial, and industrial sector has risen steadily for the past five years. Per capita residential electric consumption rose 11% between 1975 and 1979. Total industrial electric consumption rose 67% between 1975 and 1979. This growth reflects a 31% increase in per job consumption.

Natural gas consumption shows a steady decline over the 1975-1979 period. The only exception to this is the commercial sector. Residential natural gas consumption decreased 14% in the same period. (See figures 5 & 6.) Proper insulation, weatherstripping, and lower thermostat settings can save significant amounts of heating energy. An estimated 45% of the homes in Sunnyvale are not properly insulated and 82% are not weatherstripped adequately. More than half of the homes have nighttime thermostat settings higher than recommended by the Energy Commission.

The natural properties of the sun can provide for building heating and cooling. This was a factor not taken into consideration during the main development years; thus, few buildings are designed to take advantage of this. Proposed developments are required to meet State performance standards for passive and active solar applications. Solar retrofitting existing buildings can also produce significant savings both in terms of energy and money.

Building retrofits, other than solar can also produce significant energy savings. Some of the largest employers have undertaken significant building retrofits. It is estimated that 40 to 50% of electric use in industrial buildings is for heating and cooling and lighting. Savings of up to 40% in electricity have been realized from building retrofit involving the lighting and heating systems.

Environmental Management

Large quantities of energy are consumed in delivering water and treating it after it is used. In Sunnyvale an average of 23.7 million gallons of water are used daily and 17.1 million gallons are treated at the Waste Water Treatment Plant. It is estimated that 11 BTU are used to treat one gallon of water.

The Water Pollution Control Plant is designed to produce methane through anaerobic digestion of sludge. During the summer season 180 MBTU/day are produced and during the winter season 90 MBTU/day are produced. Of this, only 20% is used to operate the plant. Because of lack of storage capabilities, 80% of the gas is flared off. The City is planning to install storage of methane in the near future. In addition to the gas produced, the City purchases 17,670 therms (1.767,000,000 BTU) of natural gas and 1,165,000 KWH during the canning season and 19,030 therms (1,903,000,000 BTU) and 785,700 KWH during the non-canning season.

Solid waste collection and disposal is also energy intensive. In 1980 323,300 gallons of propane were used for garbage collection and 35,000 gallons of diesel were used at the sanitary land-fill. The garbage collection figure will increase significantly after the current land-fill is full and a new location is identified.

Studies are being conducted on the feasibility of a garbage-to-energy facility. Current economic conditions do not produce a favorable cost/benefit ratio for such a facility. However, limited garbage-to-energy applications are currently operating at Lockheed Missile and Space Company where 7.7 million KW per year are produced from burning of paper products. Potentially, this kind of facility can be developed to serve other areas in Sunnyvale.

Recycling is also present in Sunnyvale. There is extensive recycling of paper and cardboard products in the industrial sector. However, 200 tons of paper and paper products are discarded into the City's waste stream each day. The residential sector is recycling 1137 tons of products each year and there is a potential 8,750 tons that could be recycled. The City is considering a City-wide residential recycling program.

Through a variety of conservation measures, the City's energy expenditures have been significantly lower than the consumer price index increase for energy related items. Approximately 6% of the City's operating budget is for energy related goods such as gas and electricity and automotive fuel.

The waste water treatment plant is the single highest energy user for the City, in spite of producing 20% of its energy requirements. Other high users include provision of potable water, street lights, automotive fuel, and building heating, cooling and lighting.

Significant steps have been taken by the City to reduce energy costs. Savings of 52% of natural gas use and 20% electricity use have been realized at the Civic Center. The conversion of street lights to high pressure sodium is saving the City about 1/2 the cost of street lighting prior to the conversion. The City's long term goals include continuing to identify energy savings possibilities and increasing the City's production of energy to minimize reliance on outside energy sources.

GOALS AND POLICIES

I Transportation

Goal A Provide for Safe and Efficient Vehicular Movement on Streets

- A1 Maintain traffic control devices in good operating condition
- A2 Optimize traffic signal system performance
- A3 Work closely with other jurisdictions responsible for roadways within Sunnyvale to improve traffic flow

Goal B Promote Convenient and Efficient Alternatives to the Automobile

- B1 Support a transit service that provides a convenient and inexpensive alternative to the auto for both Sunnyvale residents and residents of other communities traveling to Sunnyvale
- B2 Create and maintain a safe and effective system of roadways and bikeways suitable for bicycle use
- B3 Assure the provision of adequate bicycle support facilities at all major bicycle usage locations
- B4 Provide a pleasant and safe environment for pedestrian movement
- B5 Provide facilities that encourage integrated usage of different modes of transportation

Goal C Increase Ridesharing, the Use of Non-auto Travel Modes, and Off-peak Traveling in Order to Reduce Traffic Congestion, Energy Consumption, and Air Pollution

- C1 Work with the County, individual employers, and the Santa Clara Manufacturing Group to encourage ridesharing and off-peak commuting
- C2 Promote ridesharing and transit usage to the general public
- C3 Encourage the bicycle as a means of transportation for persons of every age for a variety of purposes

II Community Development

Goal D Reduce the Consumption of Energy Through Land Use and Design Policies for New and Substantially Revitalized Buildings

- D1 Encourage a built environment which uses the properties of nature for building heating and cooling

D2 Foster a built environment which uses mechanical, physical and natural energy conservation measures

Goal E Decrease Energy Consumption by Existing Buildings in the Residential, Industrial and Commercial Sector

E1 Promote the energy efficiency of existing buildings

E2 Promote conservation and the conversion to replenishable energy in existing industrial and commercial processes

III Environmental Management

Goal F Conserve Energy Through The Conservation of Potable Water

F1 Minimize the amount of unproductive water loss by maintaining an efficient distribution system

F2 Promote residential and commercial water conservation

F3 Promote water conservation by industrial users

Goal G Conserve Energy by Maximizing Resource Recovery and Reuse and Minimizing Energy Consumption in the Pick-up and Transport of Solid Waste

G1 Consider source separation recycling programs

G2 Consider establishing waste-to-energy facilities as part of the solid waste management plan

G3 Minimize the consumption of non-renewable fuel required to travel to garbage disposal sites

Goal H Treat Waste Water in the Most Energy Efficient Manner and Take Advantage of the Energy Production Capabilities Existing at the Waste Water Treatment Plant

H1 Develop and use a coordinated alternative fuel program for its water pollution control plant so that minimum use and reliance are placed on outside energy sources

H2 Waste water treated at the water pollution control plant shall be reused whenever it is permitted and economically feasible to do so

Goal I Minimize Energy Consumption in the Provision of Municipal Services Without Affecting the Quality or Quantity of Services

I1 Observe strict energy conservation measures in the operation of facilities and equipment

I2 Continue researching energy technologies and transfer them whenever it is economically feasible and cost effective to do so

I3 Decrease dependency on outside energy resources by increasing City produced energy

I4 Promote energy conservation in the community

COMMUNITY CONDITIONS

ENERGY ECONOMICS

ENERGY SUPPLY

Our energy supply is limited and unreliable. Most of it comes from electricity, petroleum, and natural gas. A minute amount is produced from geothermal sources and nuclear power plants. About one-half of the natural gas and petroleum we use are imported from foreign countries, including the Persian Gulf, the Middle East, Venezuela, Libya, and Canada. Current known reserves of gas and petroleum are expected to last 35 years, given present production. In contrast, it took the earth millions of years to develop these natural resources.

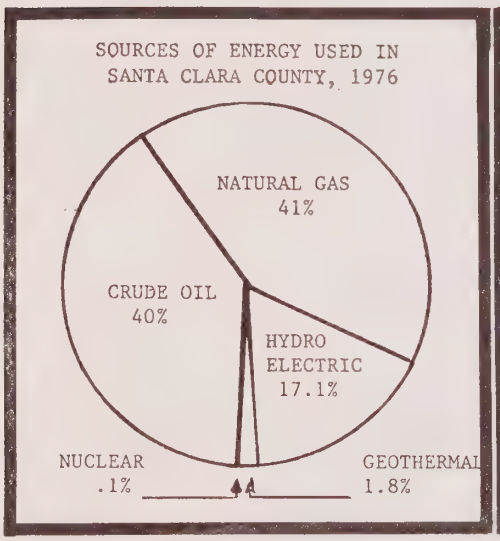


Figure A1

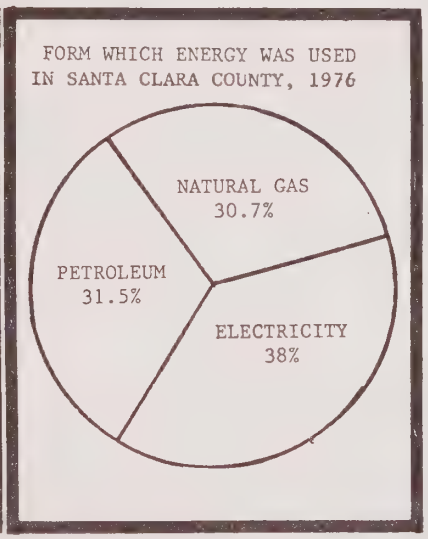


Figure B2

Electricity is largely produced from natural gas and petroleum processes. About 17% of Santa Clara County's electricity is from hydro-electric sources. Hydro-electric sources are also limited and unreliable because of environmental conditions and natural occurrences such as droughts.

Efforts to expand the supply of non-renewable and renewable energy sources are being made along with strong efforts to promote conservation. The Federal, State, and even Local Governments are identifying and using new

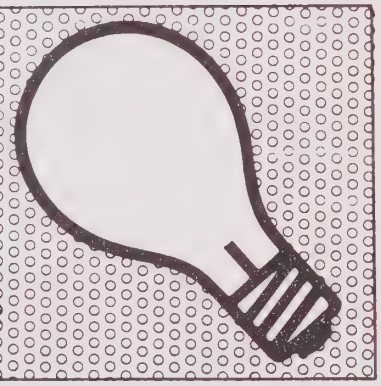
energy sources such as biomass, geothermal, and solar energy. There is also interest in returning to "old" energy sources such as wind and coal.

COST OF ENERGY

The cost of energy, in today's dollars is expected to increase about 50% by the year 2000. The average residential customer's electric bill in 1985 using 1980 dollars is expected to be $26 per month. By the year 2000 the same customer would be paying $37.70 per month in 1980 dollars. Table 1 shows the projected rates for electricity through the year 2000 for residential, commercial, and industrial customers in PG&E service area. This table is based on 1980 dollar values and does not include the general effects of inflation. Thus, additional inflationary pressures than those accounted for in the tables tend to increase the residential electricity bills even further.

Table 1

Electric Price Forecast
1980 ¢/KWH
1980-2000
PG&E Service Area



Year	Residential	Commercial	Industrial
1980	4.97	5.84	4.52
1985	5.20	6.11	4.75
1992	5.75	6.73	5.25
2000	7.54	8.69	6.90

Source: CEC Fuels Assessment Office Staff

Natural gas prices are expected to behave similar to electric prices. The average residential customer in Sunnyvale uses 5 M/BTU per month in natural gas. By 1985, the average residential natural gas bill will be $17.90 using constant 1980 dollars. By 1992, the same customer would be paying $30.40 per month for natural gas, again in 1980 dollars. By the year 2000, the cost will be $38.65 per month. Table 2 shows projected costs of natural gas through the year 2000 for the three primary sectors of the City, residential, commercial, and industrial. Again, the table does not include general inflation.

Table 2

Natural Gas Price Forecast
1980 $/MBTU
1980-2000
PG&E Service Area

Year	Residential	Commercial	Industrial
1980	3.51	4.46	4.42
1985	3.58	5.30	5.62
1992	6.08	8.44	8.60
2000	7.73	10.45	10.50

Source: CEC Fuels Assessment Office staff

The cost of driving an automobile will increase much like natural gas and electricity prices. The projected price per gallon in 1985 using 1980 dollars is $1.52. By 1992 a gallon of gas will cost $2.11 in 1980 dollars. By the year 2000, it will cost $2.49.

Table 3 shows a projected price of oil and its distillates through the year 2000 at 1980 dollar values.

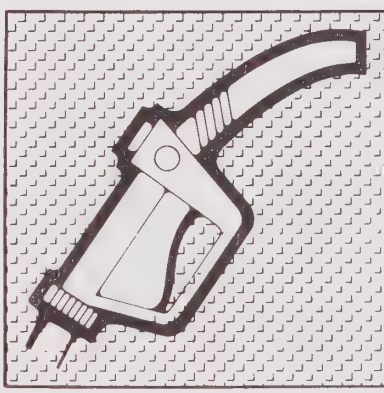
Table 3

Oil and Gasoline Price Forecast
1980 Dollars

	1980	1985	1992	2000
Crude Oil ($/bbl)	30	36	50	59
Distillate Fuel Oil	7.10	8.50	11.78	13.90
(AM/BTU)	7.10	8.50	11.78	13.90
($/gal)	.99	1.19	1.65	1.95
Gasoline				
($/gal)	1.27	1.52	2.11	2.49
($/MBTU)*	10.24	12.26	17.02	20.08

*Assumes gasoline contains 124,000 BTU/gal

Source: CEC Fuels Assessment Office staff



It is important to remember when reviewing Tables 1, 2 and 3 that the general effect of inflation has not been projected into the tables. The increases in the price

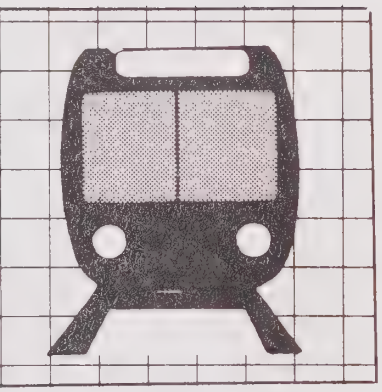
of electricity, natural gas and gasoline will be much more dramatic if a constant rate of inflation is added to the projected prices shown in the tables.

The County of Santa Clara General Plan states that in 1976, the average household paid 5.5% of their income for energy costs. It is projected that by 1985, this figure could rise to 10%. The same study estimates that County residents spent $646 million for electricity, natural gas, and petroleum. Of this, only 13% or $84 million remained in the County economy.

TRANSPORTATION

One of the largest uses of energy is by individuals for transportation purposes. Estimated weekday miles traveled on all roadways in Sunnyvale is 1.86 million. This includes travel into, out of, through and within Sunnyvale. Using a 15 miles per gallon average, this daily vehicle travel uses 115,000 gallons of fuel. About 8200 bus passenger trips are made daily.

In addition to the bus usage, about 1660 daily one way trips are made on the Southern Pacific Commuter rail line through the Sunnyvale station. This includes about 1600 trips between Sunnyvale and northbound points and 60 trips to and from southbound points.



No local data currently exists regarding the amount of bicycle usage in Sunnyvale. Limited data in other California cities suggests that from 2 to 4% of all trips in Sunnyvale are made by bicycle. This translates to 5 to 10 thousand bicycle trips per day. The mean bicycle trip length, based on a special nationwide 1975 journey-to-work survey by the Bureau of the Census, is 1.4 miles.

There are 14.3 miles of bike lanes and 2.1 miles of bike paths, and 3.6 miles of signed bike routes in Sunnyvale. An additional 1.1 miles of bike lanes are scheduled for installation in FY82. The Transportation Element contains a plan showing proposed and existing bicycle facilities. (See figure 12, Transportation Plan.)

The Commute

The home-to-work trip comprises the largest percentage of all trips. Only 15% of the 110,000 daily commuters to Sunnyvale live in Sunnyvale, according to surveys taken at major employment centers. Based on national averages, resident commuters and other automobile uses

by residents make a total of 200,000 one-way trips per day, travelling 1 1/2 miles and consuming 100,000 gallons of fuel. Residents also make 4000 bus trips, 1500 train trips and 500 taxi trips per day. The residents' means of commute are depicted in Table 4.

Table 4

SUNNYVALE'S DAILY MEANS OF COMMUTE

Type of trip	Number of trips	Trip/Job	Trip/Population
Auto	200,000	1.8	1.02
Bus	4,000	.036	.037
Train	1,500	.0136	.0138
Taxi	500	.005	.005
Bicycle	No data available		

For the estimated 95,000 persons commuting to Sunnyvale, the predominant means of transportation to Sunnyvale is also the automobile. The majority of these are single occupant automobile commutes.

However, there are two organized carpool/vanpool programs currently operating in Sunnyvale. Lockheed Missiles and Space Co. operates its own internal computerized car/van pool matching program. Bay Area RIDES provides an area-wide matching program. The following chart shows Lockheed's latest participant count. It should be noted that 8 RIDES vans are included, carrying a total of 80 passengers.

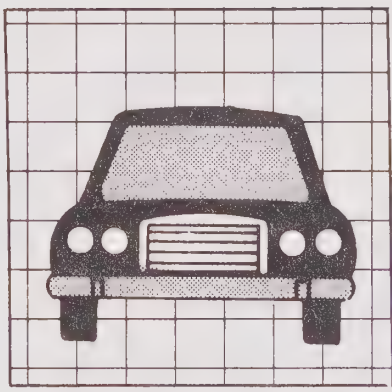


Table 5

Ride Sharing In Sunnyvale

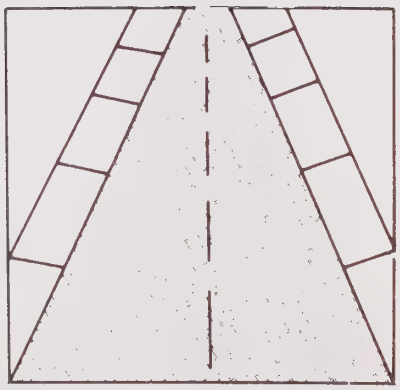
Number and Types of Transportation	Employees Carried
7 Charter buses	315
8 RIDES vans	80
20 Personal vans	200
3 motor homes	25
Car pools	1,310
TOTAL	1,930

Bay Area RIDES has 205 Sunnyvale residents registered in their carpool/vanpool program. Additionally, 879 participants have Sunnyvale destinations and 10 van pools have Sunnyvale destinations.

The Santa Clara County Manufacturing Group has been working with county employers to promote ridesharing and transit use. Ten major employment zones have been designated

each with a lead company. Two of these zones cover Sunnyvale: Oakmead, centered around Arques Avenue and Lawrence Expressway, and Moffett Field, in the area of Sunnyvale north of Highway 101. The lead companies within these areas are Signetics Corporation and Lockheed Missiles and Space Company.

The street systems plays an important role in energy consumption in transportation. An efficient street system allows orderly and uninterrupted traffic flow. This decreases the number of stops and starts and the amount of time that vehicles must idle waiting at intersections and traffic jams.



There are approximately 270 miles of streets in Sunnyvale. This number includes freeways, expressways, arterials, collector streets, and local streets. One-hundred-twenty-four intersections are controlled by signals, of which 14 were operationally interconnected in June 1981. Fifty-four signals will be interconnected in 1982. In addition to traffic signals, the City has 8000 regulatory and information signs on City streets.

Traffic flow efficiency is measured on a scale of A to F. At A through C level traffic flow is considered efficient. Level D, although representing significant delays, for short periods, is considered tolerable for peak hour flow in urban areas. Level E and F exceed or approach intersection capacity resulting in extensive delays. Analysis by the Traffic Division shows that of 128 intersections analyzed, 84 are operating at a level of C or better, 22 at a level of service D, and 22 at an E or F level in the afternoon peak hours. The morning peak hours has only 27 intersections operating below service level C. These intersections are depicted on figure 19 of the Transportation Element of the General Plan. Studies by the City of Portland, Oregon show that increasing the average speed from 15 to 20 mph reduces gasoline consumption by 14% per mile. In January 1981, auto travel time was measured on several major north-south routes and average travel speed was about 20 mph in the morning peak period and 15 mph in the evening.

ENERGY USES IN THE CITY

THE RESIDENTIAL SECTOR

Energy consumption in the City of Sunnyvale has increased along with the increase in population, commerce, and industry. While this section relates primarily to residential consumption of energy, the effect of the

presence of energy intensive industry cannot be ignored since the demand for energy created by this sector impacts the cost and availability of energy to the residential sector. Sunnyvale residents can expect to pay more for energy and may also have to contend with energy shortages in the future.

Consumption Patterns

Per capita electric consumption in the residential sector increased from 2027 kilowatt hours (KWH) in 1975 to 2250 (KWH) in 1979, an 11% increase. Total residential electric consumption in the same period rose from 207,056,166 (KWH) to 238,578,236 (KWH), approximately 15%.

The number of residential electric customers increased from 37045 to 40577, 9.5% in the same period. (See table 6.)

Residential gas consumption has generally followed a slight downward trend. This may be due to conservation measures which in many instances are easier to institute in heating and cooling applications. Gas is the predominant form of building, heating, and cooling in Sunnyvale. A recent survey showed that of 1706 respondents, 1650 or 96% use gas heating.* Figures 2 through 6 show comparative energy consumption data for the residential, industrial, and commercial sectors.

The number of residential gas customers increased from 30,413 in 1975 to 32,327 in 1979, a 6.2% increase. Per capita residential gas consumption dropped from 362 therms in 1975 to 307 therms in 1979, 18%. Total residential gas consumption dropped from 37.017,081 therms to 32,554,744 therms or 13.7% in the same period.

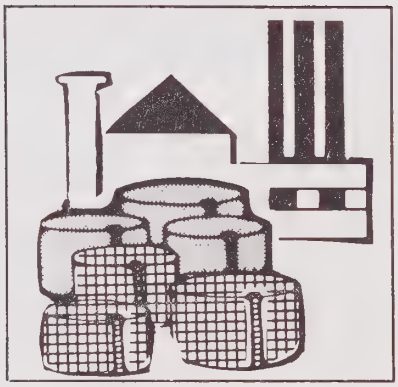
Alternative Energy Sources

Other sources of heating energy for the residential sector include wood burning stoves and solar assisted heating systems. Exact data on the number of homes using these

*A survey was mailed to 27,000 Sunnyvale residents, 2,000 or 7.4% surveys were returned. Although the information cannot be considered a valid statistical sample, survey results are used in this study as representative of community conditions.

heat sources is not available; however, the California Energy Commission estimates that 1 out of 60 homes in California have solar assisted heating systems. The survey conducted in Sunnyvale indicates that 2.4% of the homes in Sunnyvale have solar assisted systems. Water heating energy savings through solar assisted systems according to the California Energy Commission amount to 60%. Solar hot water requirements in the County of Santa Clara are estimated to save 65% of water heating energy for existing single-family residents. That is based on the assumption that the solar systems are capable of supplying 70% of the energy required for hot water. The requirements for solar hot water in new construction are estimated to save nearly 70% of the water heating requirements.

Energy demand can also be affected by conservation measures and retrofitting of buildings. Proper insulation of walls and ceilings and weatherstripping around doors and windows can save homeowners 35% of their heating bill. The survey conducted in Sunnyvale showed that 45% of homes had no insulation or improper insulation, 32% had no weatherstripping around doors, and 82% had no weatherstripping around windows.



Temperature settings influence energy consumption significantly. It has been estimated by the U.S. Department of Energy that for every degree that a thermostat is set below 70^{o} during the heating season, a savings of 3% can be realized. Similarly, for every degree above 78^{o} during the cooling season, the savings can be as high as 4%. The California recommended winter thermostat settings are 55^{o} at night and 65^{o} during the day. The survey showed that about half of the homes in Sunnyvale use winter nighttime thermostat settings exceeding 65^{o}.

THE COMMERCIAL AND INDUSTRIAL SECTOR

Seventy-eight percent of all electricity in Sunnyvale is consumed by the industrial/commercial sector. In 1979 this amounted to 879,806,863 (KWH), an increase of 67% over the amount used in 1973. The 73,940 jobs in 1975 grew to 94,000 jobs in 1979 bringing the per job consumption for this sector to 9,359 kilowatt hours in 1979 from 7,112 kilowatt hours in 1975, a 31% increase. This significant increase is a result of industrial growth, particularly growth in the electronics industry.

Gas consumption in the industrial sector dropped from 24,894,508 therms in 1975 to 15,425,984 in 1979, a 39% decrease. This drop was due to switching from natural gas to electricity and oil as a result of PG&E's natural gas curtailment program in 1976 as well as conservation. Contrary to the residential and industrial sectors, the commercial sector gas use increased from 13,307,293 to 16,294,323 or 22% in the same period. Per job gas consumption for the industrial and commercial sector dropped from 509 therms in 1975 to 337 therms in 1979.

The primary uses of energy in these sectors are for building heating, cooling, and lighting and for the various industrial processes. A telephone survey of the ten largest employers in Sunnyvale revealed that between 40-50% of the energy is consumed by building heating and air conditioning.

Industry has taken measures to reduce energy consumption. The survey of the ten largest employers in Sunnyvale indicates that actions ranging from replacement of lights to complex computerization load management systems have been undertaken. These measures have resulted in savings up to 40% in electric energy consumption.

Table 6

CITY OF SUNNYVALE
ELECTRICITY CUSTOMERS

Year	Residential	Industrial&Commercial	Total
1975	37045	2484	39529
1976	38188	2640	40808
1977	39079	2868	41947
1978	40106	3032	43138
1979	40577	3317	43894

Source: PG&E records

Table 7

CITY OF SUNNYVALE
GAS CUSTOMERS

Year	Residential	Industrial	Commercial	Total
1975	30413	38	1631	32082
1976	30956	38	1713	32707
1977	31385	32	1788	33185
1978	32262	31	1875	34168
1979	32327	30	2081	34438

Source: PG&E records

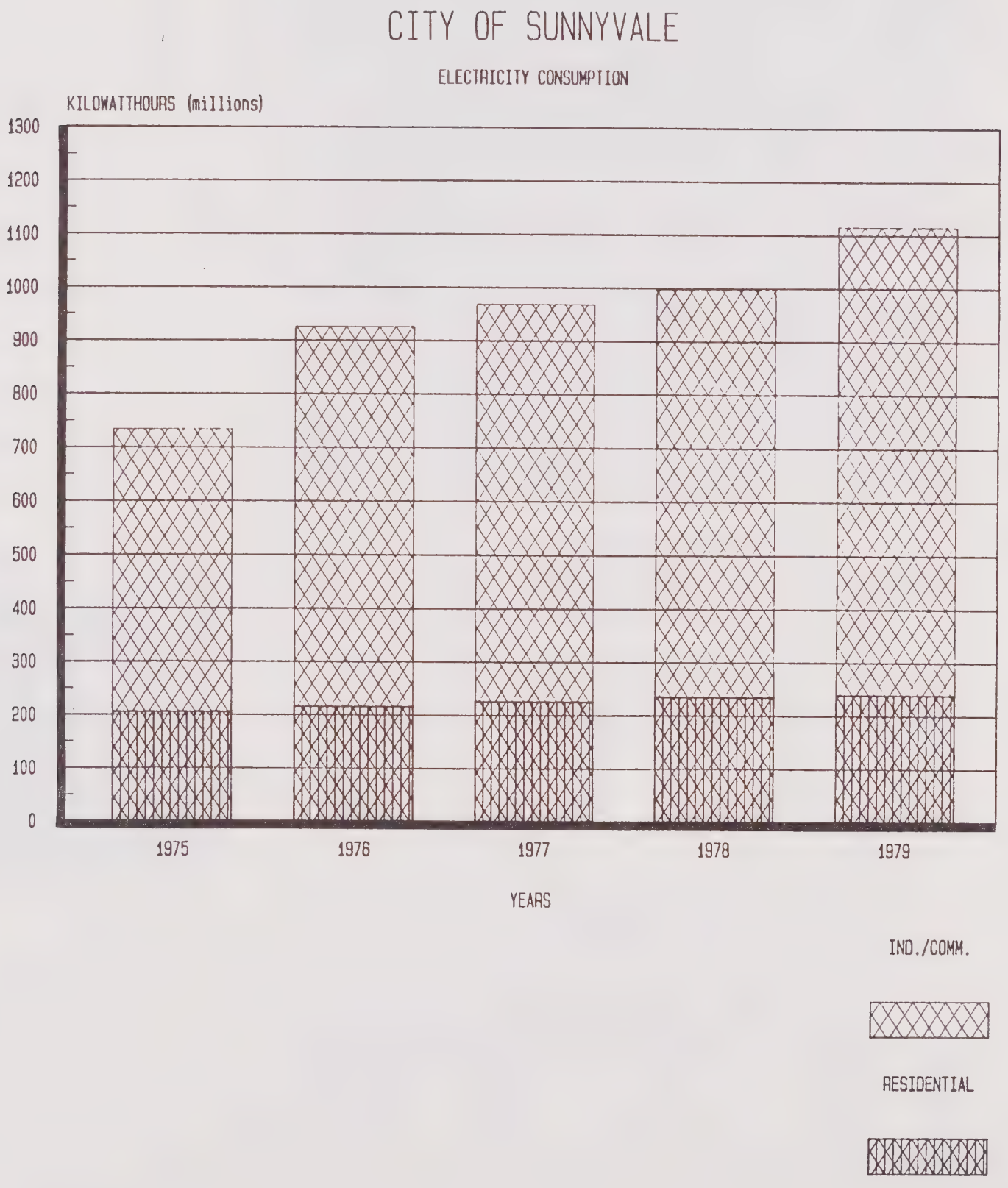
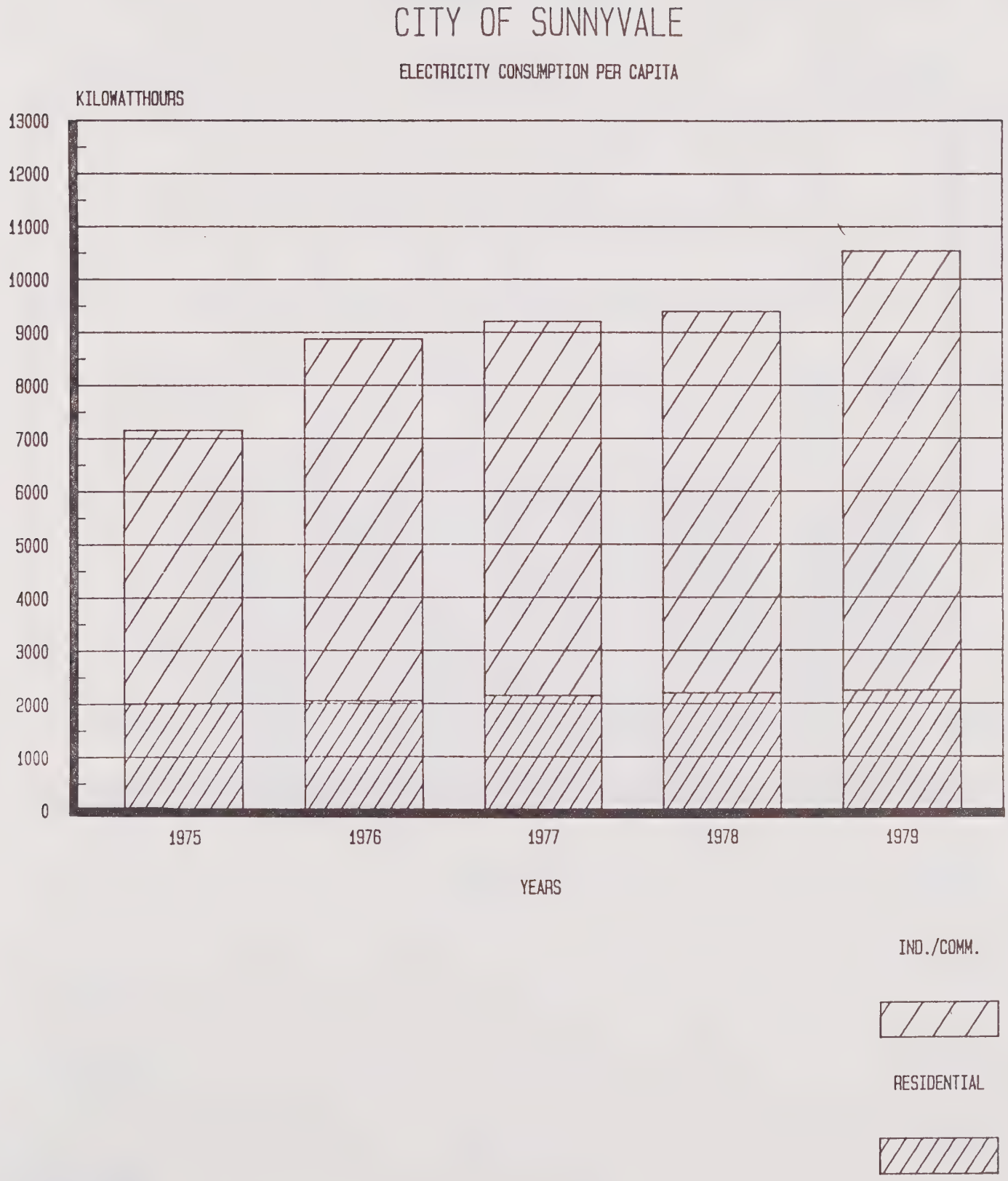


figure 3

Source: PG&E records



Source: PG&E records

figure 4

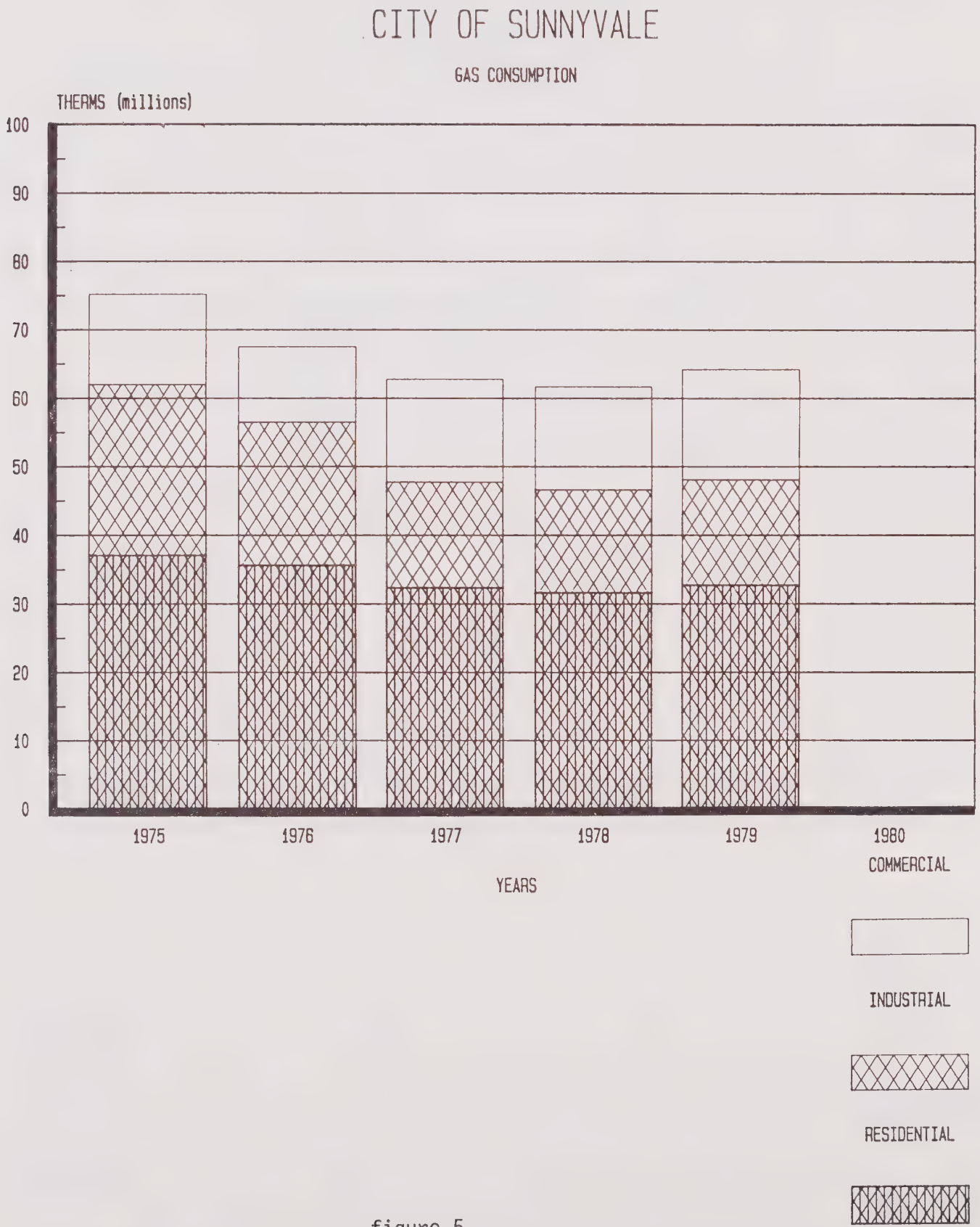
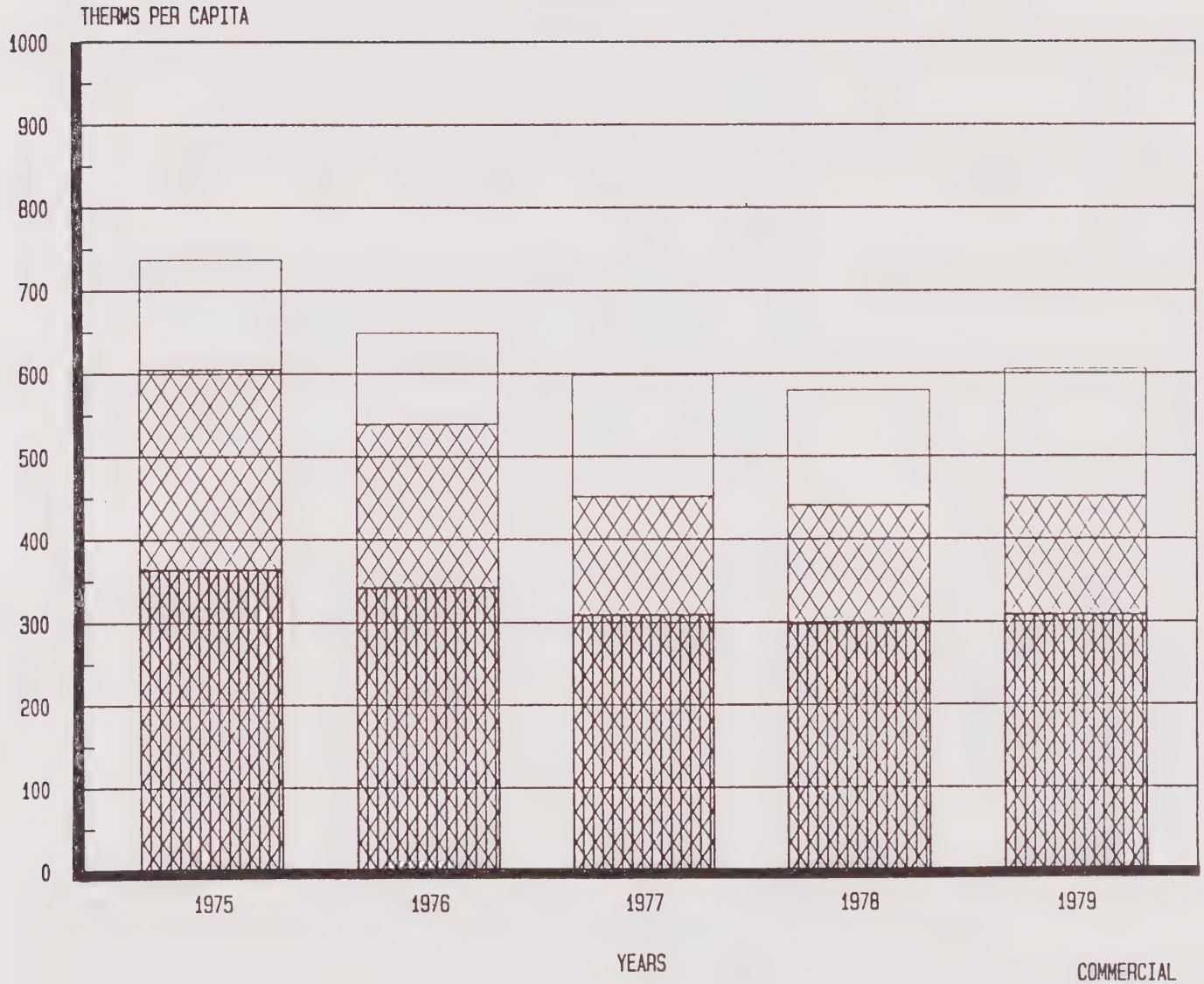


figure 5

Source: PG&E records

CITY OF SUNNYVALE

GAS CONSUMPTION PER CAPITA



Source: PG&E records

figure 6

ENVIRONMENTAL MANAGEMENT

WATER AND WASTE WATER TREATMENT

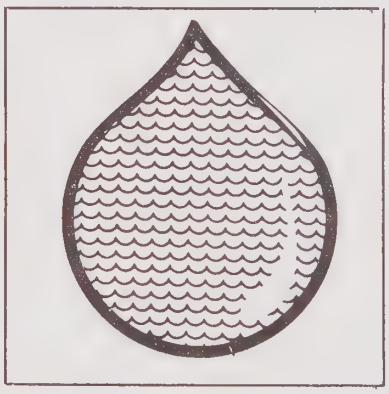
Potable Water

Providing water to the community is a service with a high energy demand. Energy is expended to deliver water and is also required to treat the water after it is used. In 1979-80 the average daily water use was 23.9 million gallons. Approximately 28% of this water was used for irrigation and lost in industrial processes. The remaining 17 million gallons were treated at the Water Pollution Control Plant.

Statistics are not available showing the energy that is required to deliver a unit of water to its destination. It is difficult to estimate this figure because of the variety of water sources. Sunnyvale, for example, obtains its water from three sources: the Sacramento River, the Hetch Hetchy reservoir, and the local water table. It is known, however, that significant energy is consumed in pumping and treatment of potable water.

Waste Water

Approximately 17.1 million gallons of water are treated daily at the Water Pollution Control Plant. Waste water treatment is the single highest energy consuming service provided by the City. The purchased energy requirements for the plant are as follows:



MONTHLY PURCHASED ENERGY REQUIREMENTS AT WATER POLLUTION CONTROL PLANT

	Canning Season*	Non Canning Season
Therms	17,670 (1,767 MBTU)	19,030 (1,903 MBTU)
Kilowatt hours	1,165,000 (3,977,310 BTU)	785,700 (2,682,379 BTU)

*The canning season runs from June through September.

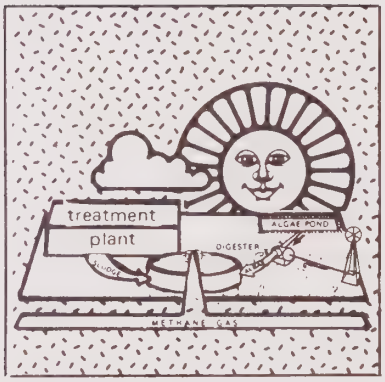
Source: Energy Use and Monitoring Study for Sunnyvale Water Pollution Control Plant by O'Brien & Associates, Inc., February 1981.

In addition to purchased energy, the City's Waste Water Treatment Plant produces its own natural gas through anaerobic digestion of sludge. It is estimated that 20% of the plants energy requirements are supplied by plant produced gas in the summer. Eighty percent of the gas produced at the plant is flared off because of lack of storage facilities.

Table 8

PLANT PRODUCED GAS USAGE

Summer Season:	
Sludge gas produced	180 MBTU/d
Used for power generation	20 MBTU/d
Used for pumping	16 MBTU/d
Net sludge gas lost	144 MBTU/d
Winter Season:	
Sludge gas produced	90 MBTU/d
Used for boiler control	3 MBTU/d
Used for power generation	10 MBTU/d
Used for pumping	11 MBTU/d
Net sludge gas lost	66 MBTU/d



Source: Energy Use and Monitoring Study for Sunnyvale Water Pollution Control Plant

Table 9

ESTIMATED TOTAL MONTHLY ENERGY USE AT WATER POLLUTION CONTROL PLANT

	Summer (Canning)	Winter (Non Canning)
Kilowatt hours	1,165,000 (3,976,145,000 BTU)	785,000 (2,681,594,100 BTU)
Therms	26,490 (2,649,000,000 BTU)	26,270 (2,627,000,000 BTU)
Total BTU	6,625,145,000	5,308,594,000

Source: Energy Use and Monitoring Study for Sunnyvale Water Pollution Control Plant

SOLID WASTE

Garbage Collection and Disposal

One hundred and thirty thousand tons of garbage are dumped at Sunnyvale's landfill annually. It is estimated that 323,300 gallons of fuel are consumed annually in collection and transporting garbage to the landfill and 35,000 gallons of diesel are used at the landfill for processing. Sunnyvale's landfill will be full by the end of 1984 and an alternative dumping site must be used. This represents a potential dramatic increase in fuel use for garbage transportation. Drastic garbage collection fee increases to pay for the transportation costs may be unavoidable.

Energy to Garbage

This waste-stream composition consists of both combustible and non-combustible materials. Sunnyvale's waste composition consist of 84% combustible materials, consisting of paper, plastics, rubber, corrugated cardboard, wood, food waste, and yard waste (see Table 10). Incineration of these combustibles can result in a large energy output. The City of Sunnyvale and several cities in north Santa Clara County have been studying the feasibility of garbage-to-energy facility. The economic analysis of this facility indicates a substantial financial risk. However, as the price of energy and the cost of garbage disposal increases, a facility of this nature may become economically feasible.

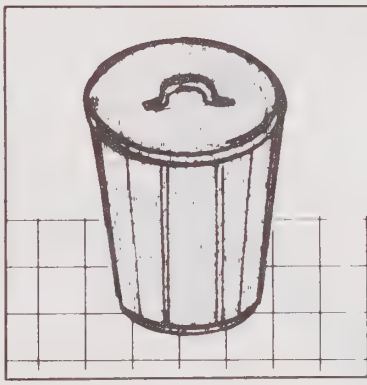


Table 10

SUNNYVALE WASTE COMPOSITION IN TONS

Composition	Residential (Tons)	Commercial/ Industrial (Tons)
mixed paper	20	94
newsprint	18	46
corrugated cardboard	15.6	60
plastic	7	31
yard waste	3.6	14
food waste	3.14	11
other combustibles	10	24
ferrous metal	7	14
aluminum	1	4
glass	14.6	32
other non-combustible	negligible	1
TOTAL	99.7	331

Source: Bob Wenzlau - Energy Consultant for North County JPA

A waste-to-energy facility is operating in Sunnyvale at Lockheed Missiles and Space Co. The energy plant incinerates 25 tons of waste paper per day, producing about 7.7 million kilowatts per year. At the current average cost of 5.3¢ per kilowatt, Lockheed is saving $408,100 per year in energy costs. The energy produced is used to chill the water required for air conditioning. It is possible that additional facilities of this nature could be developed to serve the industrial area of Sunnyvale. The high BTU content of paper and other similar industrial waste makes these waste-to-energy facilities economically feasible.

RECYCLING*

There are on-going efforts in Sunnyvale at the residential, commercial, industrial, and governmental levels. For the purposes of this report an item is considered recycled when it is removed from the waste-stream and put to a higher use. In addition to Lockheed's incinerator, several other industrial firms recycle waste paper and cardboard boxes. The amount that is recycled is not known. Nevertheless, 200 tons of paper and paper products per day are discarded into the City's waste-stream.

Table 11 shows the amounts of recycled materials from the residential sector by various community recycling efforts. An additional 8,750 tons per year could be recycled form the residential waste-stream through a comprehensive recycling program.

Table 11

Residential Recycling

	Fremont High School	City Center	Civic Groups	Total
	Tons	Tons	Tons	Tons
glass	31.8	43.3		75.1
metal	8.0	1.25		9.25
oil		2,700		2,700
paper	76.3	55.5	1,006	1,137.8

Source: Residential Curb-side Recycling Feasibility Study-Geoff Ainscow, 1981.

*Residential garbage collection includes all curb-side collection. Most single-family, duplex, triplex, and mobile home parks are included in this form of collection. Commercial garbage collection includes all collection done by loading trucks. Most residential apartment complexes are included in this category.

CITY CONSERVATION EFFORTS

About 5% of the City's operating costs are for energy, including natural gas, electricity, and automotive fuel. In spite of an 82% increase in the average price of fuel, gas and other utilities, between May 1978 and May 1981, the City's energy expenditures have only increased by 16%. Table 12 shows the City's energy expenditures as a percent of total operating expenses.

Table 12

Energy Expenditures

Fiscal Year	Operating Costs	Energy Costs	Percent
1977-78	17,291,000	1,588,400	5.71
1978-79	30,437,000	1,743,403	5.72
1979-80	33,394,383	1.787,641	5.35
1980-81	38,575,634	1,809,788	4.69

The major energy uses by the City are for sewage treatment, building lighting and heating, ventilating and air-conditioning, street and parking lot lighting, automotive fuel, and pumping potable water. Significant energy conservation measures in most of these energy intensive areas account for the City's ability to counteract the inflationary trend in the energy field. The following list summarizes some of the more significant energy conservation steps undertaken by the City since 1977-78:

- converting all interior building lights to energy saving flourescent lights
- delamping throughout all administration buildings and library
- lowering building thermostat settings to 65^{o} in winter and raising them to 78^{o} in summer
- down sizing City vehicle fleet
- use of methane for waste water treatment plant operations
- adoption of administrative policy on energy conservation for facilities and equipment
- appointment of staff energy committee
- appointment of citizens energy committee
- use of fiber-optics in pedestrian crosswalks
- extensive feasibility studies for maximizing methane production and use at waste water treatment plant
- appointment of an energy coordinator
- establishment of an internal City employee carpool program
- energy audits for Civic Center buildings.

Energy conservation efforts at the Civic Center show the results of an agressive conservation program. Significant decreases in energy use are attributable to modified thermostat settings and lighting changes. It is estimated that the savings at this complex for 1980 were over $45,000. The average decrease in natural gas use has been 52% and in electricity 20%.

COMMUNITY CONDITION INDICATORS

ENERGY - COMMUNITY CONDITION INDICATORS

	FY 1969-70	FY 1974-75	FY 1979-80	FY 1980-81	FY 1981-82
Vehicle miles traveled on weekday			1,820,000	1,858,000	1,895,000
Number of traffic signals interconnected	18	28	30	14	54
Miles of bike lanes, routes and paths	.5	.5	15.8	20	23
County bus routes serving the City	6	13	10	11	16
Southern Pacific commuter trains per day	38	38	37	37	41
Average daily train passengers to and from Sunnyvale	1,615	1,297	1,700	1,760	1,910
Total annual kilowatt hours per capita in residential sectors		2,027	2,250	2,225	2,200
Total annual kilowatt hours per capita in industrial and commercial sectors		5,178	8,296	8,200	8,200
Total annual therms per capita used by the residential sectors		362	307	300	290
Total annual therms per capita used by the industrial and commercial sectors		374	299	290	280
Average daily BTUs of City produced fuel used			2,819	2,819	2,819
Tons of garbage generated annually	115,070	120,310	139,520	126,482	141,300
Tons of garbage recycled			n/a	1,221	1,500
Total fuel used in collection of disposal of garbage			n/a	358,000	358,300
Energy consumption by City as a percent of operating costs			5.35	4.69	4.69

ENERGY GOALS AND POLICIES

The Energy Sub-element establishes a set of integrated goals, policies and actions. It is a local commitment to act and function in a given way. The Sub-element provides guidance for decision making when confronted with specific proposals.

This Sub-element contains policies which affect various areas covered by other elements and sub-elements of the General Plan such as Housing, Transportation, and Environmental Management. The goals and policies contained in this Sub-element will be repeated and cross-referenced as appropriate in other elements and sub-elements of the General Plan.

The goals, policies and action statements within the Energy Sub-element are based on certain assumptions, as follows:

1. The citizens of Sunnyvale desire to conserve energy without significantly changing their standard of living.
2. There is a limited supply of energy.
3. The cost of energy will increase in response to the limited supply and on-going demand.
4. No major new sources of "cheap" energy will be found in the immediate future.
5. A steady supply of energy is crucial to the economic well being of Sunnyvale.
6. Government should take a role in assuring a steady supply of energy to the community.
7. Energy availability is a world-wide concern requiring cooperation beyond Sunnyvale's borders.
8. In order to cope with the limited supply of energy, there must be cooperative efforts between government, the citizenry, and the private sector.
9. The policies and programs of this sub-element cannot solve the energy situation, but can provide relief to its impact on our community.

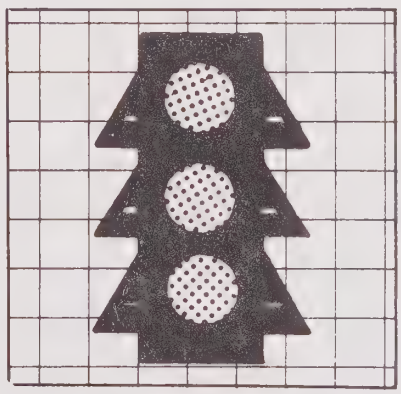
TRANSPORTATION

GOAL A: PROVIDE FOR SAFE AND EFFICIENT VEHICULAR MOVEMENT ON STREETS. (Goal A, Transportation Element)

Safe and efficient movement of vehicles on the street system promotes energy conservation by minimizing the number of starts and stops. Vast amounts of energy in the form of petrol fuel and other non-renewable fuels are consumed by idling vehicles. A system that optimizes the movement of vehicles will generate considerable energy savings.

Policy A1: Maintain Traffic Control Devices in Good Operating Condition. (Policy A-3, Transportation Element)

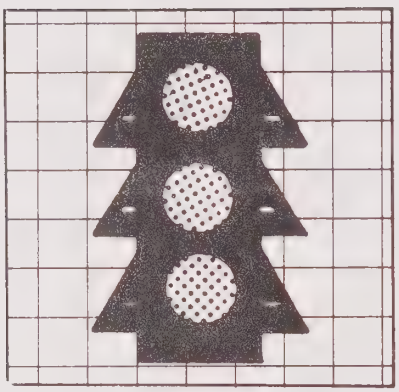
Proper traffic signal operation is essential to the oderly flow of traffic. A signal malfunction can instantly disrupt traffic and cause serious congestion problems which results in fuel waste.



ACTION:

A.1a: Respond quickly to signal breakdowns and sign damages and losses. (A.3a, Transportation Element)

When a signal malfunctions, there must be an immediate response to repair the signal to ensure safe, orderly, and efficient traffic flow through the intersection during the interim period.



A.1b: Conduct regular maintenance of the signal system. (A.3b, Transportation Element)

Policy A2: Optimize Traffic Signal System Performance. (Policy A5, Transportation Element)

Optimization of traffic signal system performance allows a roadway system to achieve its highest practical traffic-carrying capacity. In addition, improving signal performance can reduce delay and increase travel speeds, thus fostering more efficient use of non-renewable energy fuel resources.

ACTION:

A.2a: Interconnect groups of signals. (A.5b, Transportation Element)

Electrical interconnection of signals allows for green signal progressions to be established, and is more sophisticated systems, allows for entire groups of signals to react in a coordinated fashion to changing traffic conditions. Several groups of signals are already programmed for interconnection.

A.2b: Monitor traffic control performance. (A.5a, Transportation Element)

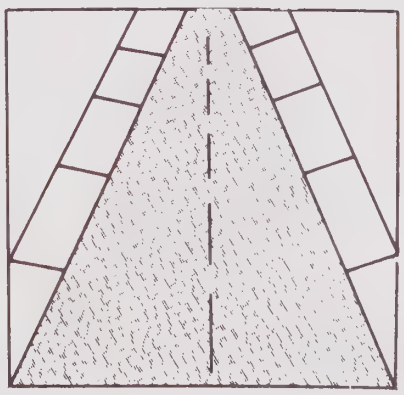
Intersection performance must be monitored to determine whether signal improvements are necessary to improve traffic flow.

A.2c: Make appropriate hardware improvements. (A.5c, Transportation Element)

Signal performance can be enhanced by the use of more advanced equipment. Improved hardware can expand the system's capability by providing additional phasing and added responsiveness to changing traffic conditions. The City will periodically evaluate the potential benefits of acquiring new equipment.

A.2d: Make appropriate software improvements. (A.5d, Transportation Element)

Software improvements refer to the development of improved timing plans that better serve the traffic condition being designed for or which trigger a particular timing plan's operation. Since traffic patterns change over time, it is essential that timing plans be periodically re-evaluated to determine if they are still appropriate for the current traffic patterns. Software improvements for both high and low volume conditions need to be considered.



Policy A3:

Work Closely with Other Jurisdictions Responsible for Roadways Within Sunnyvale to Improve Traffic Flow. (Policy A7, Transportation Element)

Several of the major thoroughfares in Sunnyvale are operated by the State of California and County of Santa Clara. They form a vital component of the Sunnyvale street system, and carry about half the total traffic within Sunnyvale. The City of Sunnyvale has a great stake in how these roadways are managed and maintained.

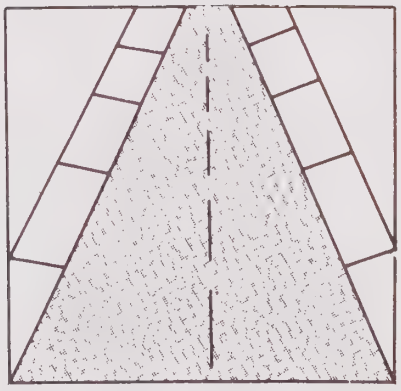
ACTION:

A.3a: Propose improvements to facilities controlled by other agencies.
(A.7b, Transportation Element)

City staff will make recommendations to the State of California and Santa Clara County regarding the operation and configuration of their facilities in Sunnyvale.

A.3b: Review and comment on all proposed changes.
(A.7d, Transportation Element)

Where the responsible agency proposes operational changes to its roadway, Sunnyvale will take an active role in reviewing and commenting on the proposed changes. Special attention will be given to how the changes affect overall traffic flow and traffic conditions in Sunnyvale particularly at streets adjacent to or intersecting the roadway.



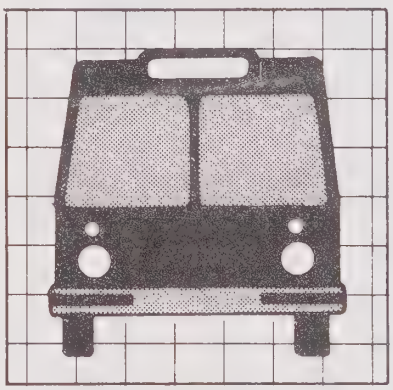
A.3c: Investigate the feasibility of acquiring County and State streets.
(A.7a, Transportation Element)

The desirability and feasibility of acquiring responsibility for El Camino Real and the Central and Lawrence Expressways will be studied. Although the City may have to assume maintenance costs, the City would then have the authority to make selected improvements to these roads and integrate their traffic signals with its own signals.

GOAL B: PROMOTE CONVENIENT AND EFFICIENT ALTERNATIVES TO THE AUTOMOBILE. (Goal B, Transportation Element)

The City recognizes that alternative modes of transportation such as buses, carpools, bicycles, motorcycles, and walking can have a significant effect on traffic conditions in Sunnyvale and in the consumption of non-renewable energy resources.

Policy B1: Support a Transit Service That Provides a Convenient and Inexpensive Alternative to the Auto for Both Sunnyvale Residents and Residents of Other Communities Traveling to Sunnyvale. (Policy B1, Transportation Element)



ACTION:

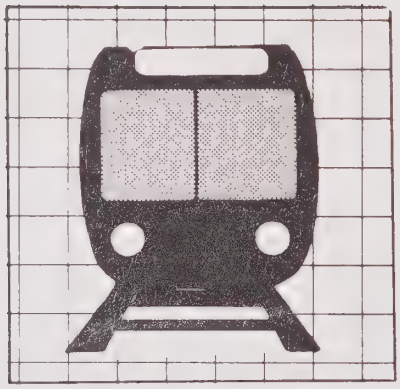
B.1a: Encourage Santa Clara County, CALTRANS, and the Southern Pacific Railroad to provide a high level of transit service to Sunnyvale. (B.1a, Transportation Element)

Transit services in Sunnyvale are operated by Santa Clara County (buses) and the Southern Pacific Railroad in conjunction with CALTRANS. The City of Sunnyvale's major role is to work with these agencies to ensure that a high-level of transit service is provided. In 1981, much of Sunnyvale's population lived more than one-quarter mile from a bus route; bus service should eventually be provided within a quarter mile of all residents. Also,

because there is so much commuting into Sunnyvale, bus service should link Sunnyvale's industrial areas with other major population centers in Santa Clara County. In 1981, the amount of bus service operated in Sunnyvale as a proportion of all County bus service was slightly below Sunnyvale's population as a percentage of the County's population. Sunnyvale should work to correct this imbalance.

B.1b: Propose improvements to transit routes serving Sunnyvale.
(B.1b, Transportation Element)

City staff will review the routes and schedules of bus and train service in Sunnyvale and propose changes to Santa Clara County. Since the amount of bus service allocated to Sunnyvale is limited, Sunnyvale must review the local route structure to ensure that resources are allocated effectively.



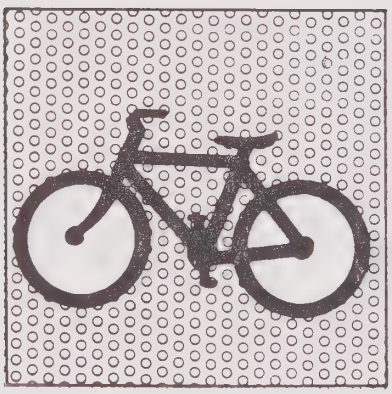
B.1c: Review and comment on all proposed changes to transit service in Sunnyvale.
(B.1c, Transportation Element)

Santa Clara County and CALTRANS plan to expand bus and rail service in Sunnyvale. The City will review these and other proposed changes and make comments regarding the priority of various proposals and suggest alternative changes when appropriate.

B.1d: Designate the Southern Pacific Railroad right-of-way as a transportation corridor.
(B.1e, Transportation Element)

Because Sunnyvale is nearly fully developed, it is extremely costly and disruptive to construct major new roadways or widen existing ones. Although there are no present plans to discontinue rail service on the SP line, the SP right-of-way should be designated as a permanent transportation corridor to ensure that it is available in the future for various modes of transportation.

Policy B2: Create and Maintain a Safe and Effective System of Roadways and Bikeways Suitable for Bicycle Use. (Policy B3, Transportation Element)



Bicycles and cars must often compete for space on the City's roadways, making it hazardous for bicyclists. It is essential that special facilities be provided for bicycles on routes where there is heavy bicycle traffic. Sunnyvale has several miles of existing bicycle lanes and routes and additional lanes will soon be implemented. Safe cycling will promote the use of bicycles as an alternative transportation mode and potentially save significant amounts of energy.

ACTION:

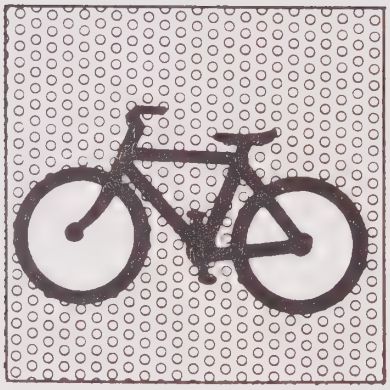
B.2a: Design a program to maintain the roadways in a manner suitable for safe cycling. (B.3a, Transportation Element)

Bicycle lanes and routes will be clearly marked and signed. In addition, the City will try to eliminate all physical

hazards to bicyclists on City streets by repairing potholes and trenches and sweeping the streets regularly. Priority will given to streets with bicycle lanes and bicycle routes.

B.2b: Consider cycling needs in all future roadway projects. (B.3b, Transportation Element)

In all new capital projects, the City will attempt to incorporate bicycle facilities such as lanes and traffic signal detection equipment in the new design.



B.2c: Make existing bicycle facilities and roadways conform to the latest bicycle facility criteria. (B.3c, Transportation Element)

Existing signing and striping will be modified as appropriate so that they stay in conformance with the latest standards established by CALTRANS.

B.2d: Encourage the designation of a network of traffic arterials which includes separated bike facilities where feasible.

Policy B3: Assure the provision of Adequate Bicycle Support Facilities at all Major Bicycle Usage Locations. (Policy B4, Transportation Element)

For the past year, the City has actively encouraged developers to provide bicycle support facilities such as bicycle lockers and showers. The City will continue to review development proposals to assure that bicycle support facilities are provided when feasible and appropriate. The City will also consider the establishment of an ordinance that requires

specific bicycle support facilities in new developments.

ACTION:

B.3a: Encourage the provision of appropriate bicycle support facilities whenever a property develops or redevelops. (B.4b, Transportation Element)

B.3b: Examine feasible options for retrofitting existing developments with bicycle support facilities. (B.4c, Transportation Element)

B.3c: Develop standards for the provision of bicycle support facilities which can be incorporated into the City's zoning code. (B.4a, Transportation Element)

B.3d: Install bicycle support facilities at the City Hall, Library, Corporation Yard and other appropriate facilities.

Policy B4: Provide a Pleasant and Safe Environment for Pedestrian Movement. (Policy B.5, Transportation Element)

Although most locations in Sunnyvale can be accessed directly by automobile, there are many areas with considerable pedestrian activity without sidewalks. The City will attempt to make pedestrian movement both safe and pleasant so that walking becomes a viable mode for short trips. It is recognized that short trips are the most inefficient uses for automobiles from an energy standpoint. Alternatives to the short distance automobile trip must be developed.

ACTION:

B.4a: Study the appropriateness of the present master plan for sidewalks within the City. (B.5a, Transportation Element)

Many streets, particularly in industrial areas, do not have sidewalks. On those streets where many pedestrians are observed, sidewalks should be installed.

B.4b: Widen sidewalks when necessary to adequately accomodate peak pedestrian traffic. (B.5b, Transportation Element)

B.4c: Separate pedestrian and vehicular traffic where feasible. (B.5c, Transportation Element)

Separating pedestrians from cars is a major way of making walking more enjoyable and safer. Simply providing a sidewalk where none currently exists is a major technique for doing this. Other techniques such as pedestrian overpasses, a re-routing of traffic, and landscaping between automobile and pedestrian routes will also be considered in areas where substantial pedestrian activity occurs.

B.4d: Provide signalized pedestrian crossing phases and displays where otherwise hazardous. (B.5d, Transportation Element)

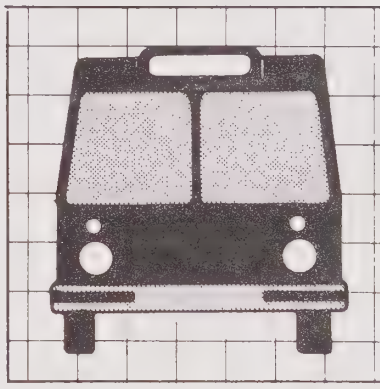
All signalized intersections with substantial pedestrian traffic should provide pedestrian crossing phases and displays. Such phases and displays enhance pedestrian

safety and improve traffic flow.

B.4e: Continue the City's " Safe Way to School Program". (B.5e, Transportation Element)

Policy B5: Provide Facilities that Encourage Integrated Usage of Different Modes of Transportation. (Policy B6, Transportation Element)

Travel by non-automobile modes is often made easier if the automobile can be used to access these other modes. Likewise, using two non-auto modes to complete a trip is often more convenient than having to rely upon only the bus, or train, or bicycle. Facilities should be provided to facilitate the combined use of different modes.



ACTION:

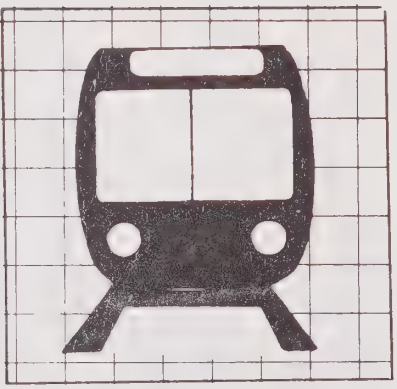
B.5a: Cooperate with CALTRANS and Santa Clara County to study the feasibility of a downtown transportation center. (B.6a, Transportation Element)

A downtown transportation center would provide a common transfer point between the Southern Pacific Railroad, Greyhound buses, and local transit buses. Currently, buses load at various locations in the downtown area. Creating a single terminal would make transferring between buses and trains easier.

B.5b: Work with CALTRANS and Santa Clara County to provide park and ride lots and bicycle locking

facilities at the Southern Pacific Railroad stations and express bus stops. (B.6b, Transportation Element)

A large portion of the Southern Pacific ridership drives to the railroad station and the two parking lots available to SP commuters are consistently full. The City will work to ensure that additional commuter parking is provided at the Sunnyvale station and at the proposed station at Lawrence Expressway. The City will also try to have bicycle locking facilities installed at the railroad station to encourage the use of bicycles rather than cars to get to the station. Finally, the City will investigate whether park and ride lots and bicycle locking facilities are feasible along any of the express bus routes that pass through Sunnyvale.

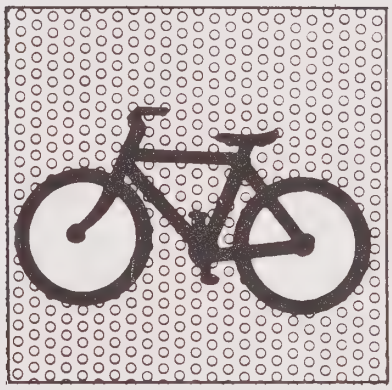


B.5d: Encourage Santa Clara County transit and the Southern Pacific Railroad to coordinate schedules. (B.6c, Transportation Element)

To enable buses to be used as a feeder mode, buses and train schedules must be coordinated. In 1981, the four bus routes that serve the SP depot provide a very poor connection with train service, particularly in the evening. The City will work to improve the situation.

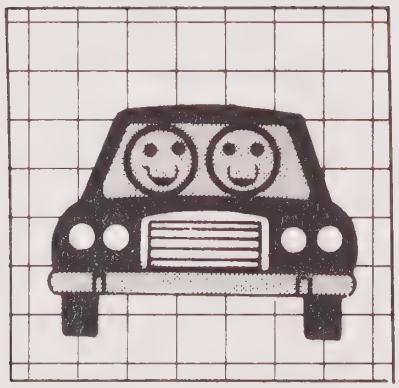
B.5e: Advocate that Santa Clara County Transit and Southern Pacific Railroad provide for bicycles on their vehicles. (B.6d, Transportation Element)

Neither of the transit operators in Sunnyvale provides for the carrying of bicycles on their vehicles. Allowing bicycles would result in additional patronage by those persons whose destinations are far from the transit route, or who cannot adequately secure their bicycles where they board the transit vehicles. This potential market is especially large for the Southern Pacific Railroad.



GOAL C: INCREASE RIDESHARING, THE USE OF NON-AUTO TRAVEL MODES, AND OFF-PEAK TRAVELING IN ORDER TO REDUCE TRAFFIC CONGESTION, ENERGY CONSUMPTION, AND AIR POLLUTION.
(Goal C, Transportation Element)

Transit, bicycling and walking should be not only for those without automobiles, for their use as substitutes for the automobile reduces energy consumption, air pollution, and traffic congestion. Carpooling, while still relying on the automobile, has the same benefits. Similarly, the shifting of travel from the morning and evening peak commuting hours to less congested times will also decrease overall congestion, and consequently lower air pollution and energy usage.



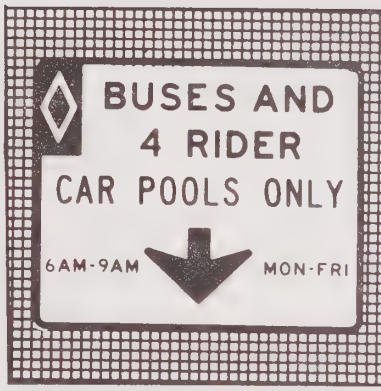
Policy C1: Work With the County, Individual Employers, and the Santa Clara Manufacturing Group to Encourage Ridesharing and Off-peak Commuting.
(Policy C, Transportation Element)

Because work trips are made repeatedly, they are the easiest to induce into transit or a car-pooling arrangement. Therefore, great emphasis will be placed on shifting work trips away from single-occupant automobile commuting. This can be done most effectively by working directly with employers.

ACTION:

C.1a: Encourage employers to establish internal carpool and vanpool programs, provide preferential parking for carpools, sell and/or subsidize transit passes for their employees, and establish flexible and/or staggered work hours. (C.1a, Transportation Element)

All of the aforementioned tactics will encourage commuters to rideshare or use public transit. Experience in other cities has shown that the greatest impact occurs when an employer establishes a comprehensive program to promote alternative transportation.



Policy C2: Promote Ridesharing and Transit Usage to the General Public. (Policy C2, Transportation Element)

ACTION:

C.2a: Provide carpooling and transit information to the general public. (C.2a, Transportation Element)

The City now provides printed information in the City Hall reception area. Other outlets for this information will be sought. Also, City staff will speak to school groups and citizen organizations to inform them of available services.

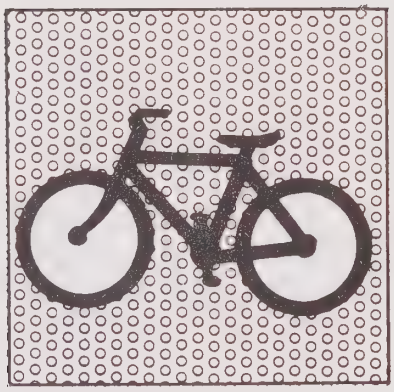
Policy C3: Encourage the Bicycle as a Means of Transportation for Persons of Every Age for a Variety of Purposes. (Policy C3, Transportation Element)

Although persons under eighteen are most likely to use bicycles, the City should encourage bicycling by persons of all ages and for a variety of trip purposes. Bicycling is an excellent way to reduce energy use and Sunnyvale's mild weather and flat terrain makes bicycling a viable transportation mode for many persons.

ACTION:

C.3a: Prepare and distribute maps which indicate the suitability of streets for bicycle travel. (C.3a, Transportation Element)

The City will prepare maps that show existing bicycle paths, lanes, and routes, planned facilities, and the suitability of all facilities. These should be made as widely available as possible and should be displayed in public buildings. The City should also solicit public input regarding the appropriateness of existing bicycling facilities.



C.3b: Integrate planning of bike lanes in the City with those of neighboring communities. (C.3b, Transportation Element)

It is important that continuity of the system is achieved and preserved on the regional system.

COMMUNITY DEVELOPMENT

GOAL D: REDUCE THE CONSUMPTION OF ENERGY THROUGH LAND USE AND DESIGN POLICIES FOR NEW AND SUBSTANTIALLY REVITALIZED BUILDINGS.

Land use and planning policies play a key role in energy conservation. Patterns in land use established now will be here for many years and if the proper patterns are established, the energy savings could be significant. It must be kept in mind that retrofitting neighborhoods is much more difficult than providing energy conservation measures in the original development. Much of Sunnyvale was built at a time when energy conservation was not a key aspect. Although not much land remains available for development, there are opportunities for redevelopment and the proper planning steps taken now will have long-term energy conservation impacts.

Policy D1: Encourage a Built Environment Which Uses the Properties of Nature for Building Heating and Cooling.

There are numerous means for using the properties of the sun to provide heating and cooling without consuming non-renewable resources. These means range from building design and orientation to the type of vegetation that is planted around the buildings. Studies by DOE, the Solar Energy Research Institute,

and other agencies have demonstrated that the proper application of these natural methods can significantly reduce energy consumption.

ACTION:

D.1a: Analyze current standards for street trees. Where appropriate establish standards which provide for the functional shading of City streets. The proper vegetation can provide a significant savings in air conditioning costs. In choosing the vegetation it is important to recognize that during the cold weather months, the emphasis is on maximizing the availability of sunlight. The City has not established street tree standards based on energy conservation.

D.1b: Establish standards and require the use of landscaping which contributes to energy conservation in commercial and industrial environments.

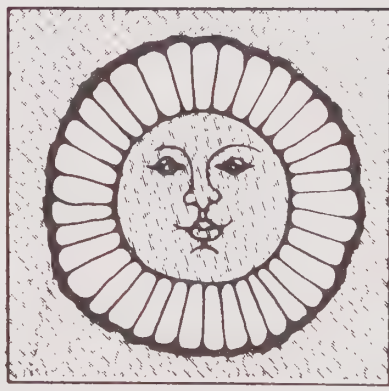
Functional landscaping can decrease the temperature caused by the reflective properties of the sun and provide for cooler temperatures in and around buildings. Some jurisdictions have established landscaping standards which can be modified for adoption in Sunnyvale.

D.1c: Establish standards and require shading of newly developed parking lots and encourage the shading of existing parking lots.

Shaded parking lots with proper vegetation experience substantially lower temperatures in the vicinity. This, in addition to providing for a cooler ambiance in the buildings surroundings creates a more enjoyable condition for walking and bicycling in the area. In addition, this reduces the requirement for auto air conditioners because autos stay cooler while parked.

D.1d: Provide flexibility in City codes in terms of setbacks so that buildings can have the most advantageous solar exposure.

Developing buildings with proper solar orientation allows for maximizing the heat-gain in the wintertime and; given the proper type of shading, heat-gain in the summer-time will be minimized. This can be accomplished through the use of the Planned Development Zoning for lots where the building cannot be properly oriented within the established setbacks. This may require City staff to analyze each development for compliance and in some cases assist the developer in establishing the proper lay-out.



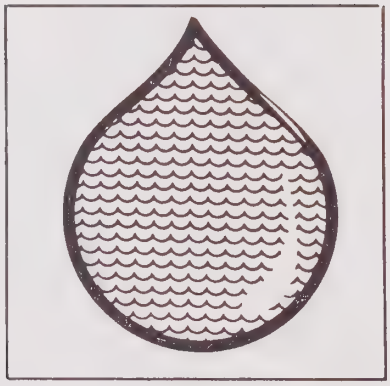
D.1e: Adopt solar access provisions to ensure solar access to users and potential users of solar energy.

In order to promote the use of solar energy, users and potential users have to be

assured that they will have access to the sun now and in the future.

Policy D2: Foster a Built Environment Which Uses Mechanical, Physical, and Natural Energy Conservation Measures.

Energy related building requirements are dictated in Title 24 of the building code. In some cases, the City may wish to impose energy conservation requirements which exceed those in Title 24. If so, the City must prove the cost effectiveness of the additional requirements. This can be done through internal studies or through those coordinated by other agencies. For example, the cost effectiveness of solar assisted hot water for residential construction has been established by Santa Clara County. However, for commercial and industrial domestic uses it has not been established.



ACTION:

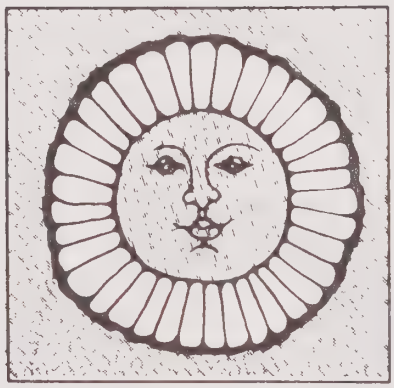
D.2a: Consider requiring solar assisted residential domestic hot water systems in new construction.

Under existing law, (Calif. Public Resources Code Section 25402.1 (8)(2), the California Energy Commission must approve any requirement which exceeds those of Title 24 of the building code.

The County of Santa Clara has performed the required studies

which demonstrate the cost effectiveness of residential domestic hot water. These studies have been certified by the State of California Energy Commission. Conditions prevalent in Santa Clara County apply to Sunnyvale; thus, the City could use the County's certification to establish solar hot water requirements.

D.2b: Encourage the commercial and industrial sector to consider domestic solar assisted hot water for their new facilities.



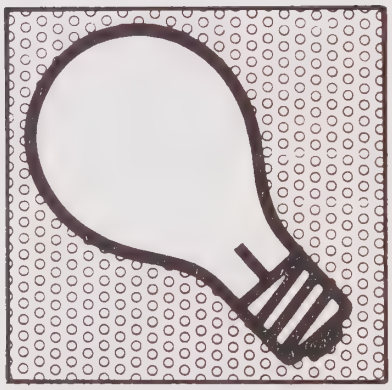
The cost effectiveness of solar hot water for domestic use in industrial and commercial facilities has not been established before the California Energy Commission. Unless those studies are conducted, solar domestic hot water requirements cannot be imposed on industrial and commercial buildings. The City has required, through its use permit powers, that domestic solar assisted hot water or a system of comparable energy saving capacity be installed. The City has the right to do so under use permit provisions, but not when a building is built and where no use permit zoning exists.

D.2c: Condition the approval of parking lots and other area lighting to require energy efficient light sources.

Commercial and industrial establishments often have parking areas and surrounding

walkways which are lit by various sources of light. Energy efficient light systems such as high pressure and low pressure sodium vapor lights have proven cost effective and have been successfully applied both in parking lots and walkway landscaped areas. In response to such evidence the City of Sunnyvale has converted all of its street lights to high pressure sodium and experienced significant savings.

D.2d: Encourage the commercial and industrial sector to consider energy conservation in design and construction of their facilities.



In many instances, energy conservation measures are easily incorporated into buildings at the time of construction, adding little or no cost to the overall project. These measures, although having a potentially rapid return on investment are not considered in planning and designing facilities. This may require that City staff develop the expertise to advise developers in this regard.

D.2e: Consider the adoption of an ordinance banning the future use of fossil, non-renewable fuel for heating newly constructed swimming pools, hot tubs and spas.

D.2f: Consider adopting an ordinance banning future drive-through facilities, and requiring conversion of drive-through facilities to walk-up facilities.

Vast amounts of energy are wasted by idling vehicles at drive-through facilities.

GOAL E. DECREASE ENERGY CONSUMPTION BY EXISTING BUILDINGS IN THE RESIDENTIAL, INDUSTRIAL, AND COMMERCIAL SECTOR.

Because Sunnyvale is nearly fully developed, the greatest impact in energy conservation will be made through measures taken in existing buildings. It is recognized that retrofitting a building is usually more expensive than providing for energy conservation in the original design. However, as the cost of energy continues to rise, retrofitting is becoming increasingly feasible.

Policy E1: Promote the Energy Efficiency of Existing Buildings.

ACTION:

E.1a: Consider adopting an ordinance to reduce or abolish building permit fees for energy related improvements such as solar assisted systems.

Residential and other types of buildings can be retrofitted with energy conservation measures such as ceiling and wall insulation, weatherstripping, solar systems, energy efficient appliances, water conservation devices, efficient lighting sources, etc. The City can take an active role in encouraging residents by promoting the use of these mechanisms through public

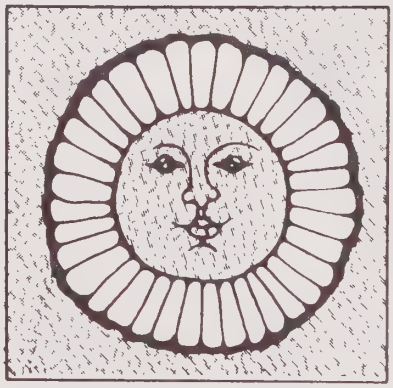
education programs or legislation.

E.1b: Encourage passive solar applications in existing buildings.

Passive solar energy applications can be installed at relatively low cost and with a very rapid pay-back period, often under one year, through shading and heat gain methods. The City can promote this through public awareness methods and technical assistance.

E.1c: Study the methods by which solar access can be protected for users and potential users of solar energy in existing buildings.

This action is more complex than solar rights protection in new buildings in that mechanisms to facilitate it have not been established. For example, a person wishing to add a second story, or a chimney, or even a tree may unconsciously render another person's solar system (or potential solar systems) inoperative. However, unless certain provisions are made, the use of solar energy will be difficult to promote.

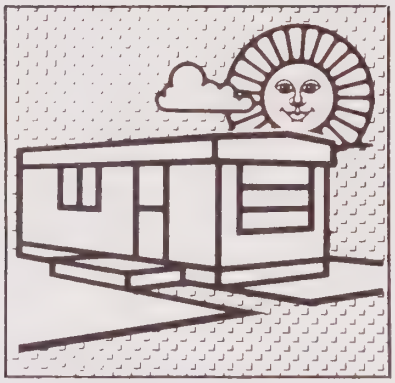


E.1d: Continue to seek and make available funds to assist in the retrofit of existing buildings which qualify for assistance under the provisions of various Federal and State programs.

The City has utilized its Housing and Community

Development Block Grants and CETA funds to assist in the retrofit of several homes which qualify for assistance. This form of assistance is extremely beneficial to low income family groups which are more significantly impacted by rising energy costs because of their reliance on a fixed income.

E.1e: Encourage energy conservation measures comparable to those for single and multi-family dwelling units in mobilehomes.



Where more practical, the retrofit of existing mobile-homes shall be encouraged to meet current State energy conservation standards.

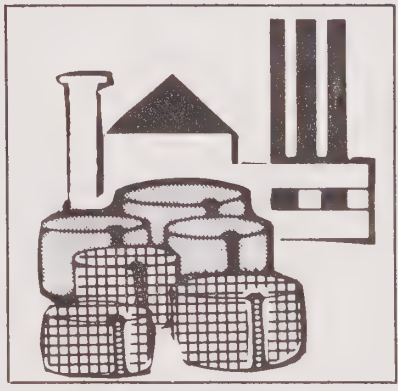
Mobilehomes have not enjoyed the attention given to other residential dwelling units in the areas of energy conservation. Yet, mobile-homes consume as much or more energy than other single-family residential units. Often, the residents of mobilehomes are on a fixed income and suffer greatly from the impact of rising energy prices. The City has recognized this fact and has dedicated certain resources to assist the mobilehome sector in energy conservation.

Policy E2: Promote Conservation and the Conversion to Replenishable Energy in Existing Industrial and Commercial Processes.

ACTION:

E.2a: Encourage through groups such as the Santa Clara County Manufacturers Group and the Chamber of Commerce that the private sector adopt strict energy conservation policies for facilities and equipment.

Significant energy savings can be achieved by adopting certain operating policies for facilities and equipment. Certain modifications to air conditioning systems and office lighting systems can make a significant contribution. Proper management of vehicle fleets and equipment can also make a significant contribution towards the conservation of energy. The City has adopted strict energy conservation standards for its own equipment and facilities.



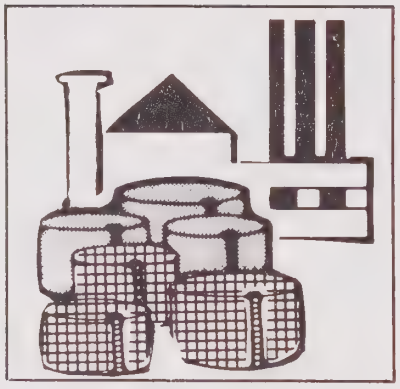
E.2b: Encourage where not presently required the installation of solar water heaters for domestic use at industrial and commercial sites.

There is sufficient evidence available that domestic water can be effectively heated by the sun both from a conservation and from an economic perspective. This condition is not only true of residential applications, but can also be applied to industrial and commercial domestic water uses. While the cost effectiveness of domestic hot water for residential uses has been certified for the County of

Santa Clara no such certification has been made for domestic application in industrial uses.

E.2c: Encourage industrial and commercial waste heat use for space heating, cogeneration, etc.

Several industrial processes used in Sunnyvale are compatible with waste heat use for space heating and cogeneration. These two applications could produce significant savings in energy.



E.2d: Encourage the industrial sector to review the feasibility of using solar hot water for process uses.

Many industries in Sunnyvale require hot water in vast quantities for their industrial processes. As the cost of energy increases, it may become cost effective to convert from fossil fuel heating system for water to a solar assisted system.

ENVIRONMENTAL MANAGEMENT

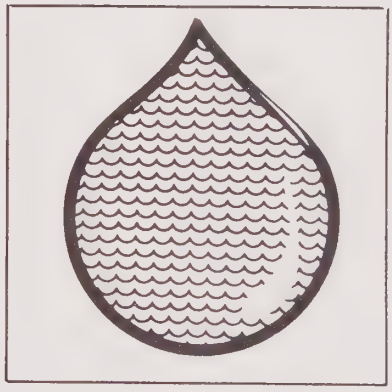
GOAL F: CONSERVE ENERGY THROUGH THE CONSERVATION OF POTABLE WATER.

Policy F1: Minimize the Amount of Unproductive Water Loss by Maintaining an Efficient Distribution System.

The amount of water use can be reduced without causing inconvenience to the public by assuring that the distribution system is working at maximum efficiency. The distribution system includes water pumping stations and underground piping.

ACTION:

F.1a: Maintain a leak detection and repair program.



Water is unavoidably lost from leaky pipes and valves. Leakage in the U.S. ranges from 2% of metered water in relatively tight systems to 16% in relatively leaky systems. An effective leak detection program can minimize this kind of waste. Sunnyvale's leakage is estimated to be about 5%.

F.1b: Maintain potable water pumps in good repair.

Engines operate most efficiently if they are properly lubricated and maintained. An improperly maintained engine will

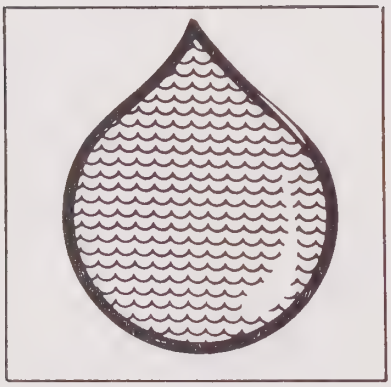
consume significantly more energy than a properly maintained one.

Policy F2: Promote Residential and Commercial Water Conservation.

ACTION:

F.2a: Promote water conservation program which includes: the use of indoor water saving devices; reduced use of appliances that tend to increase water use; water saving outdoor watering devices; landscape with low water requirements; etc.

These water conservation methods can have a dramatic effect on the amount of water used, which saves energy in the provision and treatment of water.



F.2b: Continue using an escalating rate structure in water consumption fees.

Pricing mechanisms are effective in providing incentives to conserve. Mechanisms are currently used by many utilities, including the City of Sunnyvale.

Policy F3: Promote Water Conservation by Industrial Users.

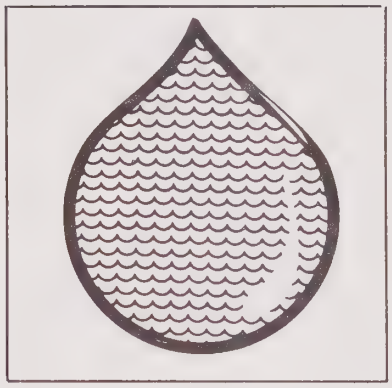
Industrial potable water use comprises 55% of total water use in Sunnyvale. Thus, conservation in this user category would have a significant impact in energy conservation as it relates to water consumption.

ACTION:

F.3a: Promote the installation of water meters in individual process units so that high usage areas can be identified.

The first step in an industrial water conservation project is to identify the large users so that more efficient conservation methods can be identified.

F.3b: Request that industrial users review their water management methods to insure that water efficient methods are used.



F.3c: Encourage industrial users to consider water recirculation applications such as cooling towers in their water using processes.

F.3d: Continue current escalating pricing policy in establishing water rates.

Economics will dictate the direction that industrial users will follow. An escalating water rate provides a strong incentive for water use conservation.

GOAL G. CONSERVE ENERGY BY MAXIMIZING RESOURCE RECOVERY AND REUSE AND MINIMIZING ENERGY CONSUMPTION IN THE PICK-UP AND TRANSPORT OF SOLID WASTE.

Approximately 127,000 tons of garbage are dumped annually at the City's sanitary landfill. It is estimated that up to 80% to 84% of that garbage is made up of materials which can be recovered and reused. The potential energy savings from recycling are considerable. For example, energy savings from recycling aluminum, based on the energy required to produce the same quantity from virgin resources is 66%, for glass it is 8.6%, and for newsprint it is 21.4%.

Policy G1: Consider Source Separation Recycling Programs.

A source separation recycling program is the most effective, economic, and easiest to implement. It consists of separating waste and recyclables at their source.

ACTION:

G.1a: Consider a curb-side recycling program for areas where garbage is collected from the curb.

The residential sector under consideration produces 35,000 tons of waste annually 25% or 8,750 tons of which consists of recyclable

materials including 3,500 tons of newsprint, 2,600 tons of ferrous metal, 180 tons of aluminum and 2,800 tons of glass.

G.1b: Consider providing a recycling program for multi-family residential units.

A multi-family residential unit recycling program is more complex than the single-family to triplex residential area program because garbage collection is done in front loading bins, not at curb-side.

G.1c: Encourage that the commercial and industrial sector establish recycling programs for paper, cardboard and other materials.

Many industrial and commercial enterprises recycle paper, cardboard and other materials. Still, there are significant amounts of these materials in the waste stream. A recycling program for this sector may be economically feasible because of the potential revenue from the sale of the recyclables or the potential savings from using the recyclables.

Policy G2: Consider Establishing Waste-To-Energy Facilities as Part of the Solid Waste Management Plan.

Relatively simple waste-to-energy facilities can be used for building heating and cooling. More complex

facilities are capable of producing electricity through the principle of cogeneration. An energy recovery system which produces the equivalent of 777,000 therms or 12,320 barrels of oil is in operation at Lockheed, located in the City of Sunnyvale. The City is participating in a joint powers study to determine the feasibility of a waste burning cogeneration facility which would handle the garbage produced by six cities in North Santa Clara County.

ACTION:

G.2a: Encourage the industrial and commercial sectors to pursue the establishment of waste incineration facilities for energy production.

G.2b: Continue participation in the North County Cities Joint Powers Authority to determine the feasibility of waste-to-energy facility capable of handling all municipal waste.

Policy G3: Minimize the Consumption of Non-renewable Fuel Required to Travel to Garbage Disposal Sites.

ACTION:

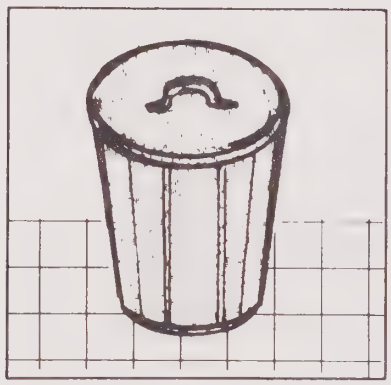
G.3a: Study actions to extend the life of the current sanitary landfill.

The current landfill is assumed to be the shortest distance to an available garbage disposal site. The life of the landfill can be extended by up to two years

if certain actions, such as raising the level of the landfill and relocating some sewer lines are taken.

G.3b: Investigate alternative disposal sites which, in the long-run, minimize distance to be traveled.

When the capacity of Sunnyvale's land-fill is reached, alternative disposal sites must be identified. In doing so it is important to seek a site which in the long-run minimizes the distance to be traveled.



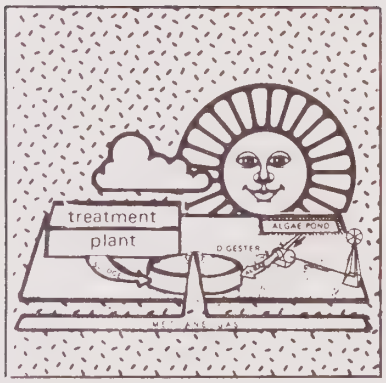
G.3c: Encourage the garbage franchise holder to continue using alternative fuel vehicles and to expand their use if cost effective.

The fleet used by the franchise holder, Specialty Garbage, is largely made up of propane powered trucks. These vehicles are more cost effective than gasoline or diesel powered ones. Converting to synthetic or other renewable fuel sources may become cost effective and decrease our dependence on non-renewable fuels.

GOAL H. TREAT WASTE WATER IN THE MOST ENERGY EFFICIENT MANNER AND TAKE ADVANTAGE OF THE ENERGY PRODUCTION CAPABILITIES EXISTING AT THE WASTE WATER TREATMENT PLANT.

Waste water treatment consumes vast amounts of energy, particularly when tertiary treatment is required. The design of Sunnyvale's Waste Water Treatment Plant, provides opportunities for producing and utilizing methane gas resulting from processes at the plant. Additionally, treated water re-use for irrigation purposes is also possible.

Policy H1: Develop and Use a Coordinated Alternative Fuel Program for its Water Pollution Control Plant so that Minimum Use and Reliance are Placed on Outside Energy Sources.

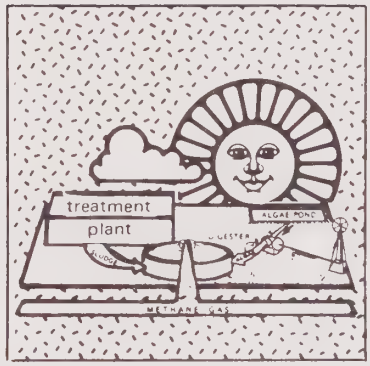


Water pollution control plants are very large users of energy, particularly the tertiary treatment facilities. There are several possible by-products that can be converted to fuels. Sludge gas produced in the digesters from primary sludge has provided about 20% of the energy used by the main engines and pumps since 1956. Other potential sources of energy that can be used by the Water Pollution Control Plant are the algae grown in the oxidation ponds, solar energy, wind energy, and methane from the adjacent sanitary land-fill

site. The City Council retained the consulting firm of Brown and Caldwell to prepare a technical report on alternate fuel sources for the Water Pollution Control Plant. The study is complete and outlines several oppurtunities for alternative energy sources at the Waste Water Treatment Plant.

ACTION:

H.1a: City shall pursue a program which maximizes the production of methane with a positive pay-back. Positive pay-back is defined as the point at which the savings from the program are greater than the cost, operations, and capital, of the program.



The Brown and Caldwell study listed several options for methane production. Some options had a relatively long pay-back period. However, as the price of energy rises, the pay-back periods will tend to decrease, thus making it possible to consider the longer pay-back period options.

H.1b: The City shall consider expanding the in-plant storage capabilities for the methane produced at the Waste Water Treatment Plant.

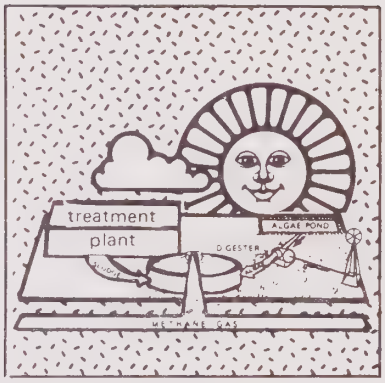
The City has burned up excess gas produced at the Waste Water Treatment Plant because of lack of storage capability. Storage capability will greatly decrease the City's reliance on Public Utility produced energy.

H.1c: The City shall study and put plant produced gas to its highest use.

Several options are available for the gas produced at the Waste Water Treatment Plant. It could be used for in-plant operations, used for electric cogeneration, sold to PG&E, or used for fuel for City vehicle fleet. Analysis is required for best use of gas.

H.1d: City shall implement load management program at Water Pollution Control Plant.

Load management refers to controlling the amount of energy used at any one given moment in order to minimize the peak energy demand which is an important factor in pricing mechanisms.



While load management does not necessarily conserve energy, it is a significant factor in the cost of energy to the City.

The Waste Water Treatment Plant offers great potential for load management because of its energy consumption volume and the availability of on-site gas.

Policy H2: Waste Water Treated at the Water Pollution Control Plant shall be Reused Whenever it is Permitted and Economically Feasible to do so.

The City's high treatment standards produce a treated water which is of reusable quality. Certain uses for this water, such as landscape irrigation are permissible.

Questions such as the water salinity effect on the fertility of the ground will have to be resolved prior to implementing a water reuse program.

ACTION:

H.2a: The City shall continue treating water to the required permit standards and investigate possible reuse application for treated water.

GOAL I: MINIMIZE ENERGY CONSUMPTION IN THE PROVISION OF MUNICIPAL SERVICES WITHOUT AFFECTING THE QUALITY OR QUANTITY OF SERVICES.

Policy I1: Observe Strict Energy Conservation Measures in the Operation of Facilities and Equipment.

ACTION:

I.1a: Enforce the provisions of administrative policies on energy conservation for City owned facilities and equipment.

I.1b: Study the feasibility of installation of a solar assisted system for domestic hot water in City facilities.

I.1c: Consider installation of solar water heating for City operated swimming pools that lend themselves for such installations.

I.1d: Conduct building energy audits at all major City facilities.

I.1e: Continue present policy to down-size City vehicle fleet and to consider energy consumption in all new equipment purchases.

I.1f: Train City staff to operate equipment in an energy efficient manner.

Policy I2: Continue Researching Energy Technologies and Transfer Them Whenever it is Economically Feasible and Cost Effective to do so.

I.2a: Continue to review literature on prospective new energy technologies and proceed to study those ideas that appear applicable to the City.

I.2b: Research available grants for innovative energy conservation measures.

I.2c: Continue to research alternative fuels for the automotive fleet.

Policy I3: Decrease Dependency on Outside Energy Resources by Increasing City Produced Energy.

ACTION:

I.3a: Continue research to expand methane production and use at the Waste Water Treatment Plant.

I.3b: Pursue alcohol fuel development projects.

I.3c: Continue to study feasibility of waste-to-energy facilities.

I.3d: Continue to study methane mining applications at sanitary land-fill.

Policy I4: Promote Energy Conservation in the Community.

ACTION:

I.4a: Provide energy information at the City library.

I.4b: Publicize City accomplishments in energy conservation.

I.4c: Maintain a Citizens Advisory Energy Committee.

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RESOLUTION NO. 359-81

RESOLUTION OF THE COUNCIL OF THE CITY OF SUNNYVALE AMENDING THE 1972 GENERAL PLAN BY ADDING AN ENERGY SUB-ELEMENT THERETO

WHEREAS, the Department of Management Services has proposed an amendment to the 1972 General Plan of the City of Sunnyvale, as amended, to add an Energy Sub-Element thereto, which proposed Sub-Element is set forth in Report No. 81-681 of the Assistant City Manager to the City Council dated November 24, 1981; and

WHEREAS, notice of preparation of a Negative Declaration on September 29, 1981, was given in compliance with the requirements of the California Environmental Quality Act of 1970, as amended, and City Council Resolution No. 162-80; and

WHEREAS, the Planning Commission, after notice duly given, held a public hearing on the proposed amendments and reviewed and considered the Negative Declaration on October 26, 1981, after which hearing the Planning Commission recommended that the City Council adopt the amendment; and

WHEREAS, the City Council, pursuant to published notice held a public hearing to consider adoption of said amendment on November 24, 1981, at which time certain amendments to said Sub-Element were approved;

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF SUNNYVALE RESOLVES AS FOLLOWS:

SECTION 1. The City Council finds and determines that the proposed amendment is consistent with the existing terms of the 1972 General Plan of the City of Sunnyvale, that it conforms with the

requirements provided for in the "Uniform Planning and Zoning Code of the City of Sunnyvale," that it is a suitable and logical change in the Plan for the physical development of the City of Sunnyvale, and that it is in the public interest.

SECTION 2. The City Council finds and determines that all necessary environmental assessment procedures have been conducted and completed in accordance with the requirements of the California Environmental Quality Act of 1970, as amended, guidelines promulgated thereunder, and pursuant to City Council Resolution No. 162-80, the Department of Community Development is hereby authorized and directed to prepare and file a Notice of Determination regarding said amendment.

SECTION 3. The Energy Sub-Element as adopted, identified as "November, 1981," a copy of which is on file in the Office of the City Clerk of the City of Sunnyvale, is hereby added to the 1972 General Plan of the City of Sunnyvale. The above-described Sub-Element, incorporating amendments approved at the time of adoption, is hereby incorporated by this reference.

SECTION 4. The Mayor and City Clerk are authorized and directed to endorse said amendment to the 1972 General Plan of the City of Sunnyvale and to show that the same has been adopted by the City Council, by signing this resolution.

SECTION 5. The City Clerk is directed to file a certified copy of said amendment to the 1972 General Plan of the City of Sunnyvale with the Board of Supervisors and the Planning Commission of the County of Santa Clara and the planning agency of each city within the County of Santa Clara. The City Clerk is directed further to file

a certified copy of said amendment with the legislative body of each city, the land of which may be included in said plan.

PASSED AND ADOPTED by the City Council of the City of Sunnyvale at a regular meeting held on the 24th day of November, 1981, by the following called vote:

AYES: Briody, Wulfhorst, Cude, McKenna, Stone, Mercer and Gonzales

NOES: None

ABSENT: None

APPROVED:

Ron Gonzales
Mayor

ATTEST:
City Clerk

By Carol Ann Butler
Deputy City Clerk

(SEAL)